

fresh

NOVEMBER 2025

Inānga or common galaxias (*Galaxias maculatus*) is the most common whitebait species. This catadromous fish lays its eggs in riparian vegetation during high spring tide. Photo credits: Dr. Emily Roberts.

Newsletter

Contents

From The Editor	3
President's Reflection	4
Student Representatives	7
Rōpū Māori Update	8

Feature Articles

Taura For Tuna	11
A New Lens On Aotearoa's Catchments	13

Research Organisations Updates

University Of Canterbury (Ferg)	17
Lincoln University	24
University Of Otago	30
Earth Sciences New Zealand	36
Cawthron Institute	44

Government Agencies Updates

Northland Regional Council	53
Auckland Council	58
Waikato Regional Council	61
Taranaki Regional Council	65
Gisborne District Council	67
Greater Wellington Regional Council	68
Canterbury Regional Council	70
Department Of Conservation	73

Environmental Consultancies Updates

SLR	80
Wildlands	82
Tonkin And Taylor	84
EOS Ecology	87



New Zealand Freshwater Sciences Society
Ngā Kohinga Wai o Aotearoa

From the Editor

Tēnā koutou

This year's newsletter highlights how our freshwater work in Aotearoa New Zealand brings together communities, scientists, hapū, students, environmental trusts, and government agencies. Together, we're taking care of our precious environment—one step at a time.

Inside, you'll find inspiring stories from regional council monitoring officers, ecologists, university professors and students, environmental consultancies, and community leaders. It's a powerful reminder of the hard work and collaboration happening across the country.

On a personal note, this year has been full of big family and professional commitments for me, and yet Summer and I

were able to bring this newsletter to life. I'm sure many of us have our own challenges and responsibilities, but we still find time to do our part to protect the beauty and resources of this planet. This newsletter is more than a collection of stories—it reflects the care and commitment each contributor has for our environment, while also balancing their own wellbeing and that of their whānau and friends. It's a celebration of mahi driven by passion and purpose.

Summer and I would like to thank all the contributors for the stories and the photos. We both enjoyed putting the newsletter together and found a friend in each other through the journey. Hope you enjoy reading it. We have more ideas for the newsletter and look forward to next year already!

Namaste

Megha Sethi

New Zealand Freshwater Sciences Society Newsletter Editor



Summer is a freshwater scientist. Some of you will remember her from Greater Wellington Regional Council. She is currently living in Whangarei and I am so glad for the opportunity to work with this hawk-eyed and creative wahine.

This is my photo at a rice paddy in Kerala, India in October 2025. The rice paddies are too full of water during the monsoon season and waterlilies take over. The farmers use this opportunity to earn some seasonal income showing tourists around. The seasonal lake supports a large number of birds, frogs and fish during the monsoon breeding season. The biodiversity enriches the water with nutrients that seep into the sediment below so, the rice paddies only need little amounts of fertilisers, if any. These stories of harmonious living with the environment help me as a freshwater ecologist and policy analyst.



President's reflection

“He taura whiri kotahi mai anō te kopunga tai nō i te pū au.”

From the source to the mouth of the sea, all things are bound together as one.

Tēnā koutou e te whānau o te wai—our members, student and early-career researchers, kairangahau Māori, practitioners, policy-makers, iwi and hapū partners, and community scientists. Thank you for the mahi you've carried through this year.

As this calendar year draws to a close, I've been thinking about how much of our work begins and ends with relationships—between people and place, between mātauranga Māori and global sciences, between evidence and decisions that affect the wai we care for. Across Aotearoa, the freshwater story remains demanding and hopeful in equal measure. Hydrological extremes, contaminants, habitat fragmentation, barriers to fish passage and the steady march of invasive species continue to test our resilience. Yet, alongside these pressures, I see the positives: better monitoring networks, sharper riverscape models, growing use of eDNA, and—most importantly—research that is co-designed with mana whenua and communities so that knowledge is useful where it matters.

This has been visible wherever our Society has gathered. At our annual conference in Rotorua in November 2024 we welcomed over 260 students, early-career researchers, practitioners, policy-makers and iwi and hapū partners into the same rooms and field sites. The theme “Haere i mua whakakotahi | Moving forward as one” was spot on, and thanks must go to Deniz Ozkundakci and the conference committee for making us feel at home in Rotorua. The fieldtrips and social events played a key role in connecting us; some of the dinner costumes were World of Wearable Art-worthy!

I'm proud of how the Society has leaned into the role of convener and connector. Our newsletters help insights travel quickly from labs and rivers to councils and marae. Thanks go to our new newsletter editorial team—Megha Sethi and Summer Greenfield—for taking on the task this year, which is only possible, of course, because of all the thoughtful contributions from our members. One of our key connectors is our Secretary, Issie Barrett, who has sent numerous emails, Facebook and LinkedIn updates—kia ora Issie. Many thanks also to Jennifer Price for leading the Society in three policy submissions this year, ensuring that national debates about freshwater are anchored in evidence and values. Jennifer,

with support from our Vice President Richard Allibone, went above and beyond to provide opportunities for all members to contribute and learn how to interface with the policy process. Because of their hard work, I have no doubt that we are well prepared for the next iteration of resource-management engagement with central government.

Investing in people is something that we do well. This year we provided scholarships and travel grants supporting students and ECRs to show up, be seen and be mentored. Three students took advantage of the SIL Travel Award and broadened their horizons overseas, and all students who applied for travel funding to attend our annual conferences were supported. Our member survey showed overwhelming support for the continuing—and, where possible, increasing—the value of travel awards. We also celebrated leadership within our Society: the 2024 NZFSS Medal was awarded to Adrian Meredith for his outstanding contributions to freshwater management and for consistently championing the value of science in often fraught consenting processes. We will keep recognising research excellence with student awards at our annual hui and through our annual Master's scholarships—congratulations to Lily Ashenden, the 2024 recipient of the NZFSS Scholarship in Freshwater Research. Thank you to the Awards committee members for all the coordination behind the scenes, and to our diligent Treasurer, Justine Quinn, for keeping track of the numbers.

A major focus this year has been updating our Society constitution. The Executive has done a great job aligning our values with the new legislation for incorporated societies. When ratified at the 2025 AGM (Tuesday 2nd December 12.30–2.00pm), our constitution will provide clearer articulation of our purpose and the means to achieve it—principles and commitments, relationships and collaboration, and activities and outputs—because culture and standards matter as much as methods.

We have been fortunate to be able to invest in growing freshwater capability beyond the Society too. The first SFA funded project included a report and webinar (with around 100 attendees) exploring why evaluating freshwater policy is so hard, and how we can get better at it. This year's call for proposals was all about developing clear, accessible information on freshwater science topics to the general public, and I look forward to seeing the resources developed next year.

Still, it's important to be honest about our challenges. Holistic science across mountains-to-moana is hard to fund and sustain (and so we are collaborating with the Save Science Coalition to shine a light on science funding issues); and long-term datasets and data stewardship needs more shared commitment (we are working towards greater support for our national freshwater datasets). Most of all, we need to keep growing Māori leadership and capability—not as a box-tick, but as the foundation for research that is relational, relevant

and enduring. I'm encouraged by emerging partnerships and by the generosity with which mātauranga is guiding priorities and practice, yet there is more to do, and the Society can help keep us accountable.

Looking to the year ahead, I see three threads to pull through. First, people and pathways: we'll continue mentoring, pastoral care and opportunities for students and ECRs, and create clearer avenues for Māori leadership across committees, awards and conference programming. It has been humbling to have strong support from the rōpū Māori and local kaitiaki who support our conferences – ngā mihi nui ki a koutou. Second, evidence that lands: we'll continue to engage with the freshwater policy cycle and develop science communications resources through our SFA fund to broaden knowledge about freshwaters and their importance. Third, strong convening: we'll deliver an annual hui that's welcoming, whānau-friendly and future-focused in December at Te Pae in Christchurch, and we will celebrate the full diversity of freshwater science in Aotearoa and Australia with the Australian Freshwater Sciences Society joining us. The conference theme is "Fresh water in flux: challenges and opportunities in an uncertain world", highlighting the dynamic and evolving nature of our freshwater ecosystems and their governance. And importantly, the conference dinner theme is 'Carnival' – I look forward to seeing you in your glad rags! None of this happens without volunteers. If you can host a webinar, mentor a student, help with a working group, or serve

on a committee, we would love to hear from you. And if you're reading this as a new member—nau mai, haere mai. The strength of Ngā Kohinga Wai o Aotearoa lies in what each of us brings, and what we share.

Ngā manaakitanga,

Joanne Clapcott

**President, New Zealand Freshwater Sciences Society |
Ngā Kohinga Wai o Aotearoa**

A snapshot of Wearable Art competition at the NZFSS conference last year. Joanne fourth from left.





STUDENT REPRESENTATIVES

Tēna koutou students of NZFSS

We hope you've had a successful year so far and you're all looking forward to the NZFSS & AFSS joint conference in Christchurch in December!

Martha Jolly and I would like to thank the outgoing student reps Holly and Maran for their work and introduce ourselves as your new NZFSS student representatives. We are both freshwater ecology PhD students based at Te Whare Wānanga o Waitaha, the University of Christchurch. Martha is in her final months and will be handing over her student rep role in the near future, so please feel free to reach out if you'd be interested to take over from her and would like to know more. We are here to act as link between students and the NZFSS, so don't hesitate to contact us with any questions or ideas, or if you just want to say hi! :)

There are lots of exciting opportunities coming up for students, especially at the conference.

On the first day of the conference, there will be a student breakfast where you can meet other NZFSS and AFSS students and catch up with old friends. There will also be a mentor-mentee networking event, and both are free to attend for all students! Also keep an eye out for student presentation awards (which will be joint with the Australians this year), the student-judged Apple Prize where you can vote for the best talk by a non-student presenter, and the 'best paper' award: if you or a friend of yours have recently gotten a paper published you should consider applying for the award.

As a student member you're also allowed to attend and vote at the AGM, which will happen during the conference as well.

If you are travelling to Christchurch for the December conference, or are planning to attend another conference, there are also NZFSS funding opportunities such as the V.H. Jolly conference travel award and the SIL Trust Fund Award. Have a look at the NZFSS website and see if you are eligible if you're in need of some extra conference travel money!

Get in touch if you'd like to know more about anything we mentioned here or about anything else, or if you just want to chat about your favourite freshwater organism (ours are alpine galaxiids, by the way. See right, **Photo Credits: Ben Crichton**)!

Ngā mihi, and see you in Christchurch!

Martha and Naomi



RŌPŪ MĀORI UPDATE

Tēnā koutou katoa, Kei te rere tonu ngā mihi ki a tātou Ngāi Māori, otirā te rōpū kairangahau Māori, me ngā taura, huri noa o te motu, e whakapeto nei i ō tātou ngoi ki te whaitakenga o ēnei o ā tātou mahi whakahirahira. Kua mauria mai e tēnei tau he momo tumatumatanga ki te nuinga o mātou i ēnei wa ngākaurua, e arotahi ana mātou ki o mātou whānau, ki ngā hāpori a ka mahi tonu tātou i ngā mahi rangatira ki te wai māori.

We continue to acknowledge you, as Māori, in particular as Māori scientists, researchers and students throughout New Zealand, with all our efforts in and for this important work. This year has brought a variety of challenges to most of us, in these unprecedented times, we focus on our whānau and local communities, while continuing our important work in freshwater.

He ai ki ngā kōrero o mua: He pātua wai mairingi, he tangata moumou taonga
AS WATER FLOWS INTO A CREVICE, SO POSSESSIONS ARE WASTED BY MAN

NZFSS EXECUTIVE COMMITTEE SUPPORT FOR TE WAI MĀORI

The NZFSS Executive Committee continue to recognise and value the contribution that Te Wai Māori – NZFSS Rōpū Māori make to the overall Society aim to ‘establish effective liaison between all persons interested in any aspect of fresh and brackish water research in New Zealand’. In particular, the Executive appreciate rōpū input into shaping annual conferences, engaging with mana whenua and facilitating kaitiaki attendance. The rōpū representatives have liaised with the Executive about the best ways to support the rōpū in this capacity.

RŌPŪ REPRESENTATIVES

Dr. Ian Kusabs, Te Arawa, Ngāti Tūwharetoa

Ian is a self-employed freshwater fisheries scientist with more than 20 years’ experience in freshwater fisheries consultancy, management, and research. He specialises in kōura and native freshwater fisheries mostly in the central North Island. Ian is actively involved in a number of iwi, hapū and Māori Land Trust and Incorporations in the Rotorua and Taupō rohe and is a freshwater advisor to the Te Arawa lakes Trust and Tūwharetoa Māori Trust Board. He is also a member of the International

Association of Astacology. Ian is based at Lake Ōkāreka, Rotorua, where he spends any free time he has fishing, wake boarding and mountain biking.

Siobhan Nuri, Ngāti Ranginui, Tūhourangi, Ngāti Pikiao, Whakatōhea

Siobhan is a PhD student at the University of Waikato and part of Te Kūwaha at NIWA. Her research is looking into the early life histories of tuna and mapping their larval dispersal routes through the Pacific Ocean. She has spent many nights searching the Rangitāiki River mouth for glass eels as they return from their oceanic birthplace. Siobhan also helps her hapū and iwi in Te Arawa with their

environmental monitoring projects. Inspiring rangatahi to look after the taiao and study freshwater sciences, she works with primary school students to provide practical in field applications of science. She is looking forward to being a representative of the rōpū and increasing engagement with students.

Kathryn Gale, Ngāti Pāhauwera, Ngāi Tūhoe

Kathryn's whakapapa is mostly around Hawkes Bay and the Bay of Plenty, but she was born and raised in Dunedin. She has spent most of her career working for iwi entities, most recently with her own people in Ngāti Pāhauwera managing taiao projects. Kathryn has recently started a PhD looking at the distribution and abundance of kākahi and little black mussel populations in Waihua. She is also a member of the Ngāti Pāhauwera Taiao Committee and supports environmental projects in the rohe. Kathryn enjoys the whanaungatanga between Māori scientists in the NZFSS and how we support each other through the challenges that come with being Māori and working in this space.

Tredegar Rangiātea Hall, Tūwharetoa, Te Arawa

Tredegar is our kaiārahi, providing tikanga support to the rōpū. Tredegar graduated in 2012 from Te Whare Wānanga o Waikato

with a Master of Social Science in Geography completing a thesis titled 'Restoring the flow: Challenging the existing management frameworks to integrate Mātauranga Māori'. He has over 10 years of experience working for iwi, previously managing Tūwharetoa's Waikato awa settlement committee and navigating the 2019 Contact Energy awa spill via a restorative justice process centred around the application of a cultural impact assessment. He is currently working as the Pou Ārahi Māori for the British High Commission working to apply a kaupapa lens across international Māori trade and foreign policy. He is also on a number of Hapū Taiao committees still in Tūwharetoa which include a relationship group with Contact Energy (geothermal) and re-consenting steering groups for the Taupō Wastewater plant and Mercury Control Gates.

HE MANAWĀ-Ā-WHENUA POSTGRADUATE SCHOLARSHIP

In 2021, the Executive agreed to establish a \$7,500 scholarship to be awarded to a Māori postgraduate student studying a Bachelor Honours degree (or equivalent) or Master's degree with a focus on freshwater ecosystems. The inaugural scholarship was open to applicants in 2021.

Ko te wai a Rona he manawa-ā-whenua; e kore e mimiti e

The waters of Rona are from an underground spring which will never run dry

If you or someone you know is eligible for this scholarship, kua e whakamā please apply. Details are available on the NZFSS website.

MĀORI FRESHWATER FISHERIES CONFERENCE 2025

Te Wai Māori Trust hosted the Māori Freshwater Fisheries Conference in Te Kūiti on 8 and 9 April 2025. Many kaitiaki wai māori gathered under the kaupapa of He Wai Pūnehu – navigating murky water, how do we work together to achieve enduring positive outcomes for freshwater taonga.

Even the lightest touch to the water's surface creates far-reaching ripples. What will our mokopuna inherit as a result of our efforts to protect our wai and taonga? He Wai Pūnehu brought kaikōrero together to show how in these times of uncertainty, it is the people through collective actions can have the greatest impact for the protection of our wai and taonga species.

For more information about this conference and the awesome mahi Te Wai Māori dom check out their website.

LAKE ŌKATAINA - WATER QUALITY MONITORING BUOY OFFICIALLY LAUNCHED

In 2024, after meeting with BOPRC, Niwa Nuri and Ian Kusabs successfully oversaw the installation of a water monitoring buoy on Lake Ōkātaina. The purpose of this project was to provide Ngāti Tarāwhai with real-time data on the health and quality of their lake. In July, Siobhan and Ian were joined by uri of Ngāti Tarāwhai for a visit to the buoy. Together, they learnt about its functions and the importance of ongoing water monitoring. After returning from the lake, Andy Bruere guided the whānau through how to access and interpret the data, pointing out unique patterns and trends.

KŌURA WĀNANGA WITH NGĀTI RANGI

In May, Ian Kusabs led a kōura wānanga with Ngā Waihua o Paerangi Trust staff from Ohakune. The group monitored tau kōura in lakes Ōkāreka and Tikitapu, set up whakaweku in Te Wairoa Stream, and learned to measure and sex kōura. The purpose of this training was to support the Trust in developing a kōura monitoring programme following recent mass kōura fatalities—approximately 500 individuals recovered—in Waitangi Stream, near Tangiwai. Pictured on the right Joseph McLeod (left), Te Hiiringa Mareikura Tane (lower right) and Ian Kusabs.

RECENT PUBLICATIONS

Clapcott J, Hoani-Waaka A, Kitson J, Baker M, Eveleens RA, Tadaki, M. 2025.

Out of sync: Transforming environmental monitoring through Indigenous perspectives of time. *Earth Stewardship*, **2**, e70021.

Stewart SD, Hamilton DP, Baisden WT, Verburg P, Muraoka K, Robertsm DC,

Hicks BJ, Duggan IC, Donovan-Pereira N. 2025. Hypolimnetic nutrient subsidies to surface waters of a large lake: A coupled hydrodynamic modelling and nitrogen isotope field assessment. *Ecosystems*, **28**.

Duggan I, Özkundakci D. 2025. Plankton. In D. Özkundakci, N. Grainger & Dean-Spiers T (Eds), *Hidden gems of the Waikato, the history, ecology, and management of the Waikato Lakes – Ō tatou, he taonga tuku iho* (pp. 303-323). Waikato Regional Council and Te Tumu Whakaora Taiao – The Environmental Research Institute (The University of Waikato)



Taura for tuna

Feature article: How a Whangārei hapū is using natural materials to help tuna get over barriers to fish passage in the Takahiwai Stream

Patuharakeke hapū in Whangārei have come up with a natural and local solution to help tuna in their local Takahiwai Stream near Ruakākā. “We noticed that elvers were not able to get up the Takahiwai dam in the headwaters of the stream” said Ari Carrington, Resource Coordinator of Te Pou Taiao o Patuharakeke Te Iwi Trust. “Cyclone Gabrielle had washed away vines and tree roots that hung down the dam”. This meant that elvers migrating upstream had nothing to climb up.

So, they called in some of their master kai rāanga (weavers), Hanna Carrington and Georgina Fenton-Pirihi to help. Hanna and Georgina got to work on a taura (rope) made from harakeke (flax) to help the tuna on their journey up the stream. Hanna said “We saw a lot of alternatives made from synthetic and plastic materials; we wanted to move towards more natural and sustainable fibres. We are Patuharakeke, we are a hapū all about harakeke so it made sense to start with that”.

They trialled taura woven out of different natural materials and in different styles. They found that adding kuta (*Eleocharis sphacelata*, a type of wetland sedge which grows upstream of the dam) to the harakeke made the taura last longer in the water.





Also, they added pōhuehue (*Muehlenbeckia sp.*) from the nearby sandunes to the taura to make it rougher to give the elvers more to hold on to as they climbed.

“You have to think like a fish” Hanna says. “We wanted to use plants growing in and around the water that our taonga know and recognise”. The taura are also covered in a special secret ingredient from the moana to attract the eels. Using these different elements in the taura acknowledges mātauranga māori and the relationship between Tāne and Tangaroa.

There are now three taura installed on the 7m high dam. The project is in its early days but elvers have already been seen climbing the taura to get to the top of the dam.

Te Pou Taiao o Patuharakeke Te Iwi Trust is now seeking permission from the dam owners to install taura on other structures upstream that also pose a barrier to fish passage.

This rōpu hopes to continue making taura for the freshwater environments in their rohe where there is no fish passage. Hanna has been teaching taitamariki in the hapū to weave the taura. Thereby handing down skills that she learnt from her mother. Ari says, “One day, we would love to see our taura used regionally and nationally to protect our fish taonga”.

Top left: A completed taura. Photo credit: Wendy Bown.

Bottom left: Riko Brown, Shay Clyde and Te Atirau Menary, Kaitaiao from Te Pou Taiao o Patuharakeke Te Iwi Trust at Takahiwai dam on the Takahiwai Stream. Three taura have been installed on the dam to help elvers on their journey upstream. **Photo credit: Wendy Bown.**



Feature Article: A New Lens on Aotearoa's Catchments

In a nation where the health of our waterways is a direct reflection of our environmental stewardship, the **Focus Catchment Map Series (FCMS)** is making waves – and not just in the streams and rivers it represents. Developed by EOS Ecology as part of the Mountains to Sea Conservation Trust's 'Wai Connection – Tatai Ki Te Wai' project, the FCMS is a science-driven yet accessible publication, designed to help communities across Aotearoa New Zealand better understand, protect, and restore their local catchments.

How the Focus Catchment Map Series is Empowering Local Communities to Restore Waterway Health

The FCMS was originally created to support the 'Wai Connection' Provider Organisations and their supported catchment groups to better understand the current state of their catchments. At its heart, it transforms complex national and regional datasets into easy-to-digest, visually compelling maps, data, and infographics – specifically designed for catchment groups, iwi, hapū, and landowners who may not have formal scientific training. Through clear interpretation and presentation, each FCMS document provides a snapshot of a catchment's past and present state based on publicly available nationwide spatial datasets and regional council monitoring data, helping to guide future decision-making to support local waterway health. The intent of the map series is to not just display information, but to tell the story of each catchment, to empower local action, and to foster a deeper connection between people and place.



EOS Ecology Principal Scientist delivers an FCMS workshop to South Canterbury farmers, Dec 2024. Photo: EOS Ecology

Making Science More Accessible

To ensure each FCMS document is not only read but used, we provided wraparound support to the network of 'Wai Connection' Provider Organisations and catchment groups, including:

- **Workshops**

In-person and online sessions with EOS scientists to walk through the FCMS.

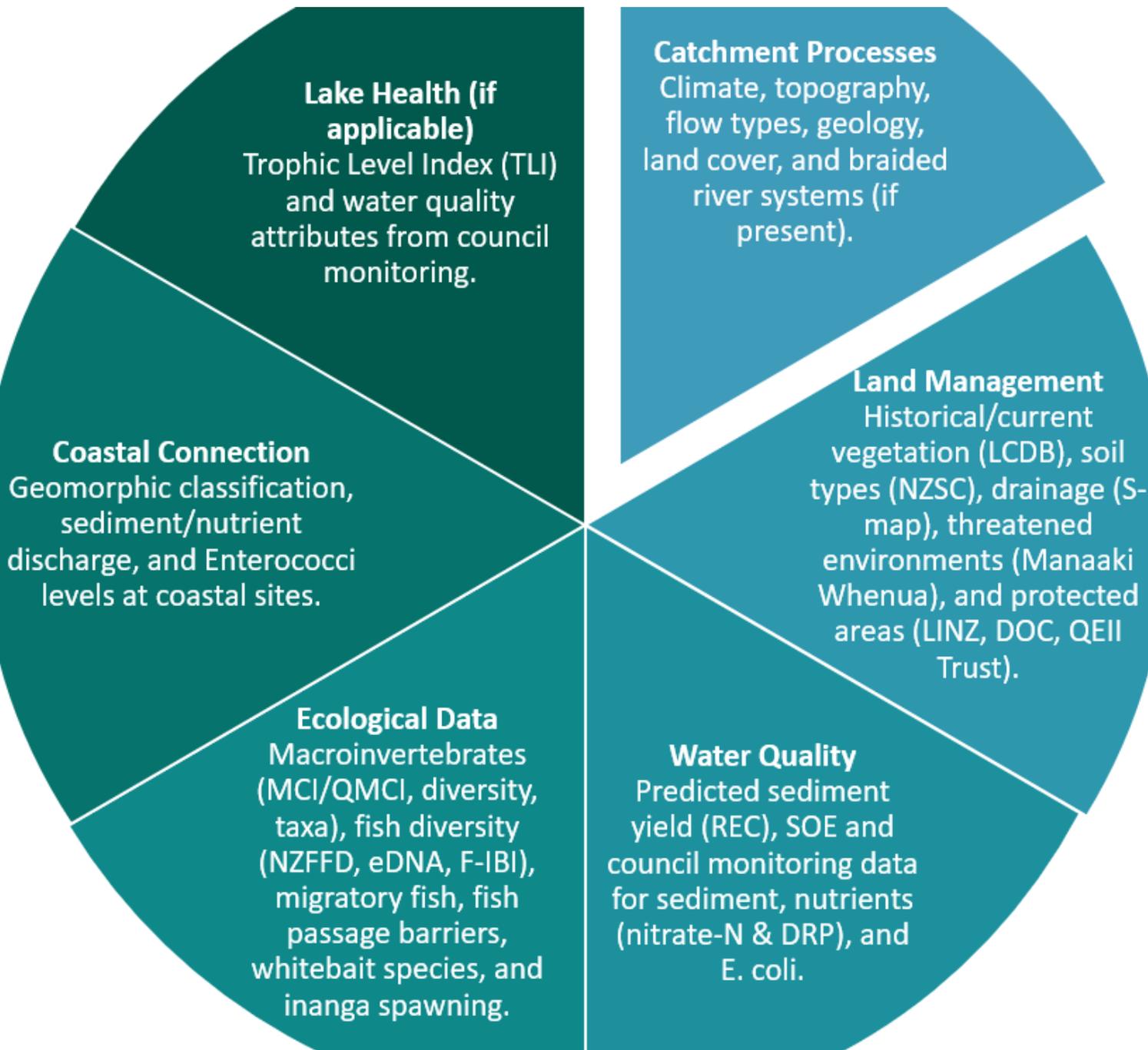
- **Resources**

PowerPoint intros, Quick Guides, FAQs, and videos (introductory and deep-dive).

- **Printing Support**

Guides to help groups produce professional hard copies for communication and funding.

What's in a Focus Catchment Map Series?



Nationwide Effort Backed by Science

To make sure the FCMS would be genuinely useful for catchment groups—and not duplicate work already being done by councils—EOS Ecology teamed up with the Hakataramea Sustainability Collective, scientists, land management advisors, and mātauranga pūtaiao experts from Environment Canterbury during a pilot project.

From February 2024 to June 2025, EOS Ecology's team of scientists, GIS specialists, and science communicators developed 52 FCMS publications, covering 3.7 million hectares of Aotearoa's mainland.

Each publication draws from up to 150 data sources, combining national models with local council data. To manage this huge volume of information, EOS built automated and repeatable workflows using professional tools like FME and ArcGIS Pro. These systems helped process over 2.8 million pieces of raw monitoring data efficiently and consistently.

To keep the look and feel of the maps uniform across all 52 catchments, EOS developed custom tools and templates. This resulted in over 1,560 maps that are visually consistent and easy to understand. Automation helped speed up production and ensured high-quality outputs every time.

LASTING IMPACT

The feedback from both councils and community groups has been overwhelmingly positive.

Several experts praised the Focus Catchment Map Series for its clarity, scientific accuracy, and value to communities and restoration efforts. Sharon Walker, Project Manager for Restoration Waingōngoro Awa, noted how the maps enhanced her team's understanding of their catchment. Elaine Moriarty, Principal Strategy Advisor at Environment Canterbury, commended the maps for presenting complex information in an accessible and visually appealing way while also fostering strong relationships with iwi communities. Sonny Whitelaw, Manager at BI highlighted the detailed design and informative content especially the infographics and ecological data. Ti James, Principal Scientist at Tasman District Council appreciated the integrated approach to river and coastal health, and praised EOS Ecology's technical and ecological expertise, expressing hope for regional rollout.

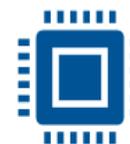
Through the 'Wai Connection' project EOS has been able to provide catchment groups across Aotearoa with a better understanding of their catchment from a science perspective. If you have a catchment group that could benefit from an FCMS, feel free to reach out to the EOS Ecology team to find out more! Otherwise, you can explore all the current FCMS outputs online at www.waiconnection.nz/pages/focus-catchment-resources



The fusion of technical data with science communication allows communities to:



» understand how their catchment functions.



» access nationally consistent modelled and monitoring data they might otherwise not have the time or ability to access.



» identify challenges and opportunities specific to their catchment.



» plan informed, effective interventions to improve waterway health.



» Identify knowledge gaps and explore ways to fill them.



» Easily compare and share their FCMS with another group's FCMS.

ORGANISATION UPDATES

Research Organisations



Upland Longjaw galaxias (*Galaxias Cobitinis*) from Te-Awa-a-takatmira|Cass river, Takapō, Canterbury, showing off its' underbite. **Photo credit:** Angus McIntosh

University of Canterbury (FERG)



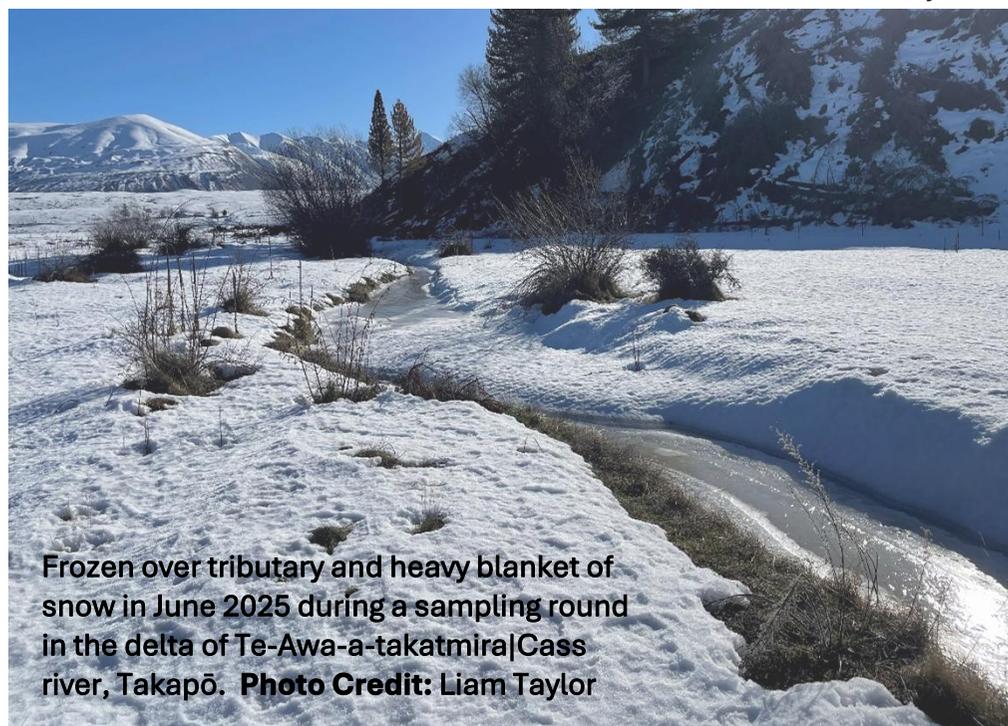
New staff or students:

Anna Meikle (MSc), Lily Ashenden (MSc), Lydia Gilbert (Hons)

ORGANISATION UPDATE

A year of milestones for FERG with 2 new Doctors, Holly Harris, Gabrielle Koerich, now in post doc positions at the US forest service in Alaska and Eawag in Switzerland respectively. Martha Jolly recently submitted her PhD and Ignacio Reyes and AJ Gillis are nearing PhD completion. Olivia Reynolds, Saskia Brown, Jack Anderson, Lucy Coulston, all submitted their MSc theses and Zoe Hamilton completed her Honours. We also sadly said goodbye to Tadeu Siqueira, who provided invaluable contributions to the group and group culture in his time, as he moved back to Brazil. FERG research students have had busy fieldwork schedules, with winter providing challenges.

Angus has been busy with a France-based international isotope food webs working group which produced a global database (Isofresh, cited below) of species-level stable isotope food webs with an individual-level global database in progress. Helen and Angus have continued research on the invasion of non-native macrophytes in high-country springs, producing multiple



Frozen over tributary and heavy blanket of snow in June 2025 during a sampling round in the delta of Te-Awa-a-takatmira|Cass river, Takapō. **Photo Credit:** Liam Taylor

outputs with Saskia Brown leading the charge to raise awareness of threats to these ecosystems (see publications). In Murihiku Southland, work has focused on partnerships with mana whenua around kanakana and stream restoration.

Jono has been working on a large review of the impacts of extreme events on river biodiversity and

continues to work with a large French consortium on understanding the wide-ranging ecological impacts of invasive species. Jono outside of core academic work continues considerable effort in public outreach with his newsletter *Predirections* on Substack (<https://predirections.substack.com>), now reaching over 18,000 people.

FEATURE PROJECTS

Spatiotemporal population dynamics of a native landlocked migratory fish and the influence of environmental drivers – Liam Taylor (MSc project)

Liam's research focusses on the spatiotemporal dynamics of fish populations with complex life cycles and the influence of environmental drivers on these. Liam is studying landlocked migratory Kōaro in the Te Awa-a-Takatamira / Cass River by carrying

on triannual sampling former PHD student Holly Harris, one of Liam's supervisors alongside Angus McIntosh, started in 2022 and using two whole river samples carried out by the Fish futures team in 2024 and 2025. From this, Liam aims to investigate the recruitment dynamics by estimating the timing of lake to river migration, model seasonal growth patterns, informed by otolith-derived growth rates, and investigate the potential influence of seasonal flow conditions on life history events and kōaro biomass. Liam is also investigating the potential role of environmental drivers in the whole river distribution and spatiotemporal habitat use of kōaro. This research is supported by Fish Futures.

Effects of environmental conditions and species interactions on native and non-native fish species co-persistence (Julian Merder – Post doc)

In October 2024, Julian joined us in a Postdoctoral position as part of the Fish Futures program. Julian focuses on using data-driven modeling methods and

interpretable machine learning to analyze large and complex environmental datasets. His work aims to assess the effects of non-native species on New Zealand's freshwater biodiversity and native fish fauna. So far Julian has been investigating the conditions under which native galaxiids can persist alongside introduced salmonids by modeling species interactions across a gradient of natural flow disturbance regimes. This work draws on three decades of ecological data from New Zealand rivers.

Living with the extremes: life history trait responses of *Deleatidium* to drying pressure and floods in the Selwyn | Waikirikiri River – Anna Meikle (MSc project)

Anna is a masters student supervised by Issie Barrett, Shelley MacDonell, Chris Meijer and Nixie Boddy. Her research aims to investigate how life history traits of *Deleatidium* respond to drying pressure and floods, giving insight into non-lethal effects of these stressors, such as changes in

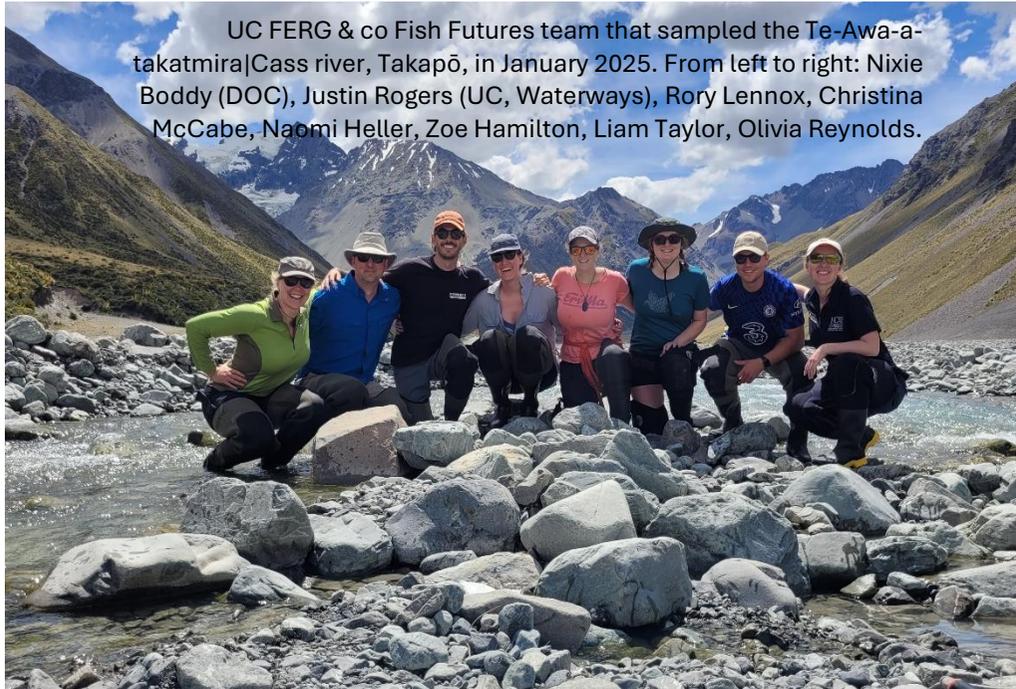
reproductive success. This work aims to understand how climate change might affect these life history traits and improve the design of management tools, such as environmental flow limits, by understanding these more complex changes. This research is supported by the Department of Conservation.

"Are We Ignoring Biology? A Global Review of Biotic Interactions in Freshwater Restoration Outcomes" - Lydia Gilbert (BSc Hons)

Lydia is looking at factors affecting the outcome of freshwater restoration and is supervised by Angus and Helen. Her research aims to understand how success of freshwater restoration projects changes based on various factors, with a focus on biotic interactions. Lydia aims by conducting a literature review to understand the factors that mediate successes and failings in freshwater restoration projects to provide guidance for future projects.

UC Fish Futures Team - Upper Waimakariri and Te-awa-a-Takatamira|Cass River

The UC Fish Futures team completed another summer of extensive sampling at the Te Awa-a-Takatamira | Cass River, Takapō, sampling Transects along the whole river and collecting several quantitative samples. The team have been focused on understanding the distributions of native galaxiid species and the potential environmental drivers. Olivia Reynolds recently handed in her MSc, with a manuscript in the works, which focused on the distribution of upland longjaw galaxias, and distribution of other fish species on a river scale, understanding the potential roles of environmental conditions and biotic interactions in mediating their distribution. The other major project the team has been working is the assembly of a database of all FERG sampling in the Upper Waimakariri catchment, which is almost completed and to be published open access online soon. This is an extensive database spanning 28



UC FERG & co Fish Futures team that sampled the Te-Awa-a-takatmirajCass river, Takapō, in January 2025. From left to right: Nixie Boddy (DOC), Justin Rogers (UC, Waterways), Rory Lennox, Christina McCabe, Naomi Heller, Zoe Hamilton, Liam Taylor, Olivia Reynolds.



Evaluating the impacts of introduced fish species on kōaro in lake systems: Lauren Hitt and Nixie Boddy (DOC) in the field using a pack raft to sample different areas of a lake for Lauren's project. Photo Credit: Angus McIntosh

years (1997-2025) and containing 701 sampling events, 506 which are quantitative, across 169 unique sites in 67 different streams. It contains over 30,000 individual fish observations of 11 different species. This database reflects the combined efforts of several people and will hopefully prove to be a useful resource. The FERG fish futures team will continue to work collaboratively with mana whenua and partners to better understand our native freshwater fish and ecosystems. Team: Angus McIntosh, Jonathan Tonkin, Julian Merder, Naomi Heller, Lauren Hitt, Martha Jolly, Olivia Reynolds, Liam Taylor.

Project name or topic: The hidden housing crisis: investigating the significance of habitat quality in urban stream systems - Lily Ashenden (MSc)

Lily Ashenden is a Masters student at the University of Canterbury and is supervised by Sara Kross and Issie Barrett. Lily's research aims to discover the significance of habitat quality in urban waterways, for the purpose of guiding restoration

actions relating to structural aspects of streams and their riparian zones.

She is also aiming to study freshwater systems and their adjacent terrestrial systems in tandem, as they are inherently linked but typically studied separately. She is achieving this by observing the impacts of habitat features on both riparian bird communities and in-stream macroinvertebrate communities, while also recording water quality, so that we can answer the question of what is worth doing in stream systems known to already have degraded water quality.

This work is supported by the NZFSS Scholarship in Freshwater Research.

Evaluating the impacts of introduced fish species on kōaro in lake systems – Lauren Hitt (PhD project)

Lauren's thesis research examines the ecology of isolated kōaro in lakes to better understand how lake food webs and kōaro populations are affected by introduced species.

Following an ambitious field season surveying fifteen lakes nationwide, we are deep in laboratory analyses of otolith-derived growth rates, stable isotopes, gut contents, morphology, and seasonal food webs.

So far, our mahi has found that isolated populations of kōaro in lakes are more threatened than originally believed, with multiple populations lost due to introductions of trout or smelt, and some lost due to unknown causes. The long periods between monitoring visits to these kōaro populations (on average almost

twenty years!) and their isolation through hydrological disconnection both contribute to the vulnerability of these unique populations, and Lauren is developing conservation priorities specifically for landlocked and lake locked kōaro.

gdmmTMB: Solving issues with compositional uniqueness indices – Daniel Hernandez

Indices of compositional uniqueness, such as the Local Contribution to Beta Diversity (LCBD), are widely used in freshwater ecology as a tool for detecting sites with potentially high conservation value, sites affected

by localised stressors, or infer broader ecological processes. However, models that regress LCBD against a set of site-level predictors may overlook a key source of variation in real communities: the directional change in community composition along environmental gradients. Daniel Hernandez and collaborators have developed a new modelling tool, Generalised Dissimilarity-Uniqueness Models (GDUM), and developed an R package (gdmmTMB) to solve this issue. The approach allows simultaneously estimating pairwise and site-level effects. Pairwise effects capture

gradients of community change that lead to increasing pairwise dissimilarity with increasing distance within those gradients, whereas site-level effects are equivalent to direct effects on uniqueness such as those in LCBD models. By better capturing the mechanisms of biodiversity change, GDUMs can help address emerging questions in freshwater ecology and improve the generalizability of findings. A beta version of the package is available on GitHub: <https://github.com/dhercar/gdmmTMB>.



Photo of Alpine tarns and Lakes during Lauren's Field work . **Photo Credit:** Lauren Hitt

University of Canterbury (FERG) Publications:

- Aspinwall, A., **Tonkin, J. D.**, Pennycook, J., Ainley, D., Gerhard, D., & LaRue, M. (2024). Factors influencing haulout behaviour of non-breeding weddell seals (*Leptonychotes weddellii*) at Cape Royds, Antarctica. *Polar Biology*, 47(10), 1055–1063. <https://doi.org/10.1007/s00300-024-03274-5>
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- Brandenburg, K. M., **Merder, J.**, Budiša, A., Power, A. M., Philippart, C. J. M., Michalak, A. M., van den Broek, T. J., & Van de Waal, D. B. (2025a). Multiple global change factors and the long-term dynamics of harmful algal blooms in the North Sea. *Limnology and Oceanography*, 70(5), 1267–1282. <https://doi.org/10.1002/lno.70025>
- Brandenburg, K. M., **Merder, J.**, Budiša, A., Power, A. M., Philippart, C. J. M., Michalak, A. M., van den Broek, T. J., & Van de Waal, D. B. (2025b). Multiple global change factors and the long-term dynamics of harmful algal blooms in the North Sea. *Limnology and Oceanography*, 70(5), 1267–1282. <https://doi.org/10.1002/lno.70025>
- Brown, S. K. McIntosh, A. R., & Warburton, H.** (2025). *Engineered change: How invasive macrophytes restructure communities in springs*. Thesis. <https://hdl.handle.net/10092/108323>
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- Brown, S. K., Warburton, H., McIntosh, A. R., & University of Canterbury, F. E. R. G.** (2025, May 29). *Invasion of non-native macrophytes alter macroinvertebrate communities in high-country springs* [Presentation]. figshare. <https://doi.org/10.6084/m9.figshare.28029365.v2>
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- Brown, S. K.*, McIntosh, A. R., Hamilton, Z. B.*, Warburton, H. J.** (Accepted) Overlooked and underestimated: Reframing restoration to include inconspicuous native invaders. *Restoration Ecology*.
- Crichton, B. R. J., Hickford, M. J. H., **McIntosh, A. R.**, & Schiel, D. R. (2024). Evaluating intra- and inter-life stage density-dependent dynamics for management of perennial amphidromous fish. *Ecological Applications: A Publication of the Ecological Society of America*, e3038. <https://doi.org/10.1002/eap.3038>
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- Winterbourn, M. J. (2025). Why many aquatic insect species are difficult to identify: Implications for stream monitoring and conservation. *Emeritus Professor, School of Biological Sciences, University of Canterbury, Christchurch.*

A stream in Canterbury. Photo credits: Angus McIntosh





New staff:

[Marc Tadaki](#) - Senior Lecturer, Department of Environmental Management

[Susie Wood](#) - Professor - Freshwater Management, Department of Environmental Management

Masters students:

Kathryn Russell - Use of metagenomics and quantitative PCR to understand the sources and significance of total coliform and E. coli detections in drinking water. Supervised by Crile Doscher, Susie Wood and Brent Gilpin (PHF).

Zac Clark - Relationships between periphyton, land-use, and environmental variables in Aotearoa-New Zealand: Patterns, drivers, and implications Supervised by James Ross and Susie Wood.

Mel Whiting - The impact of perch on Lake Denny, Ōtūwharekai Supervised by Issie Barrett and Susie Wood.

Anna Meikle - Living with the extremes: life history trait responses of *Deleatidium* to drying pressure and floods in the Selwyn |

Waikirikiri River. Supervised by Issie Barrett and Shelley MacDonell (UC).

Lily Ashenden - The hidden housing crisis: investigating the significance of habitat quality in urban stream systems. Supervised by Issie Barrett & Sara Kross (UC).

PhD candidates:

Joelle Lousberg - Zooplankton diversity and environmental gradients in Aotearoa New Zealand lakes: An integrated eDNA & morphological approach- Supervised by Susie Wood, Will Godsoe, and Lena Schallenberg, Georgia Thomson-Laing (Cawthron).

Aaron Kolder - Environmental reconstructions of deep Otago lakes. Supervised by Susie Wood, Jamie Howarth (VUW), Marcus Vandergoes (ESI).

Shreesha Bhattarai - Preventing cyanobacterial blooms in Lake Hood. Supervised by Susie Wood and Nik Lehto, Aidin Jabbari (ESI).

Linda Robb - The effect of trace metal of cyanobacteria and algal communities in the

Waikato River. Supervised by Susie Wood and Nik Lehto, Adam Hartland (LAT).

Mohammad Arar - N₂O oxide emissions from braided rivers. Supervised by Naomi Wells and Tim Clough.

Ksenia Trifonova - The effect of climate change (temperature and CO₂) on nutrient and trace element dynamics in a New Zealand reservoir lake. Supervised by Nik Lehto and Naomi Wells

Jazmynn Hodder-Swain - protecting the unique terrestrial biodiversity of braided rivers. Supervised by Marc Tadaki and Sylvia Nissen, part of Bioprotection Aotearoa

Ciara Espiner - Woody habitat utilisation and instream wood requirements of native New Zealand freshwater fish: Implications for river management practices. Supervised by Issie Barrett and Shelley MacDonell (UC).

Lovisa Ekelund - Exploring β-diversity Patterns in Headwaters: Do They Exist, and What Drives Them? Supervised by Issie Barrett, James Brasington (UC) and Nixie Boddy (DOC).

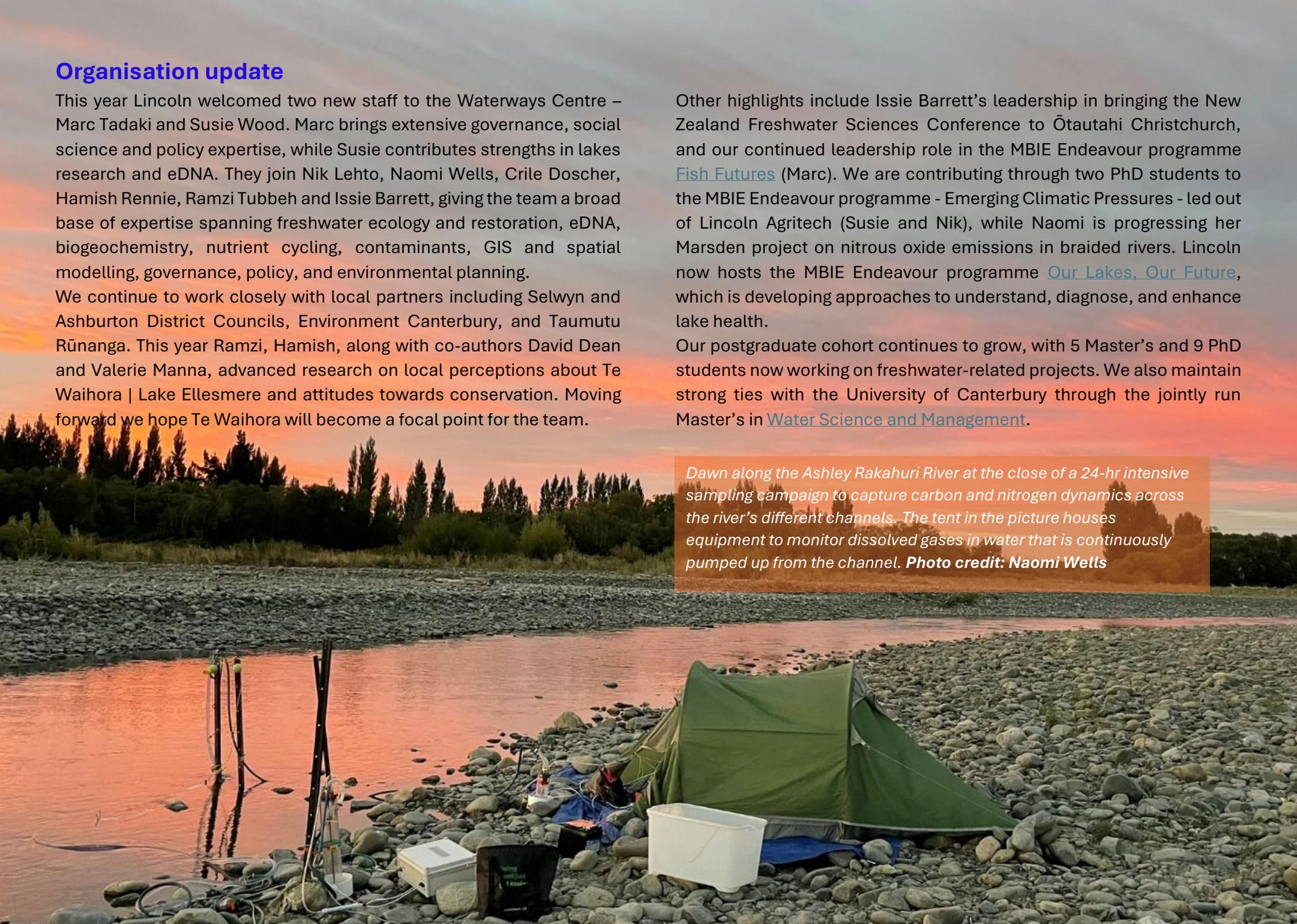
Organisation update

This year Lincoln welcomed two new staff to the Waterways Centre – Marc Tadaki and Susie Wood. Marc brings extensive governance, social science and policy expertise, while Susie contributes strengths in lakes research and eDNA. They join Nik Lehto, Naomi Wells, Crile Doscher, Hamish Rennie, Ramzi Tubbeh and Issie Barrett, giving the team a broad base of expertise spanning freshwater ecology and restoration, eDNA, biogeochemistry, nutrient cycling, contaminants, GIS and spatial modelling, governance, policy, and environmental planning.

We continue to work closely with local partners including Selwyn and Ashburton District Councils, Environment Canterbury, and Taumutu Rūnanga. This year Ramzi, Hamish, along with co-authors David Dean and Valerie Manna, advanced research on local perceptions about Te Waihora | Lake Ellesmere and attitudes towards conservation. Moving forward we hope Te Waihora will become a focal point for the team.

Other highlights include Issie Barrett's leadership in bringing the New Zealand Freshwater Sciences Conference to Ōtautahi Christchurch, and our continued leadership role in the MBIE Endeavour programme [Fish Futures](#) (Marc). We are contributing through two PhD students to the MBIE Endeavour programme - Emerging Climatic Pressures - led out of Lincoln Agritech (Susie and Nik), while Naomi is progressing her Marsden project on nitrous oxide emissions in braided rivers. Lincoln now hosts the MBIE Endeavour programme [Our Lakes, Our Future](#), which is developing approaches to understand, diagnose, and enhance lake health.

Our postgraduate cohort continues to grow, with 5 Master's and 9 PhD students now working on freshwater-related projects. We also maintain strong ties with the University of Canterbury through the jointly run Master's in [Water Science and Management](#).



*Dawn along the Ashley Rakahuri River at the close of a 24-hr intensive sampling campaign to capture carbon and nitrogen dynamics across the river's different channels. The tent in the picture houses equipment to monitor dissolved gases in water that is continuously pumped up from the channel. **Photo credit: Naomi Wells***

Feature projects

The effect of climate change on nutrient and trace element dynamics in a New Zealand reservoir lake

Ksenia Trifonova's PhD research aims to examine how changes in the future climate may affect nutrient and trace elements fluxes in freshwater environments. Ksenia has collected sediment from Te Kārapiro and deployed it into flowing water mesocosms in a PC2 controlled environment room at Lincoln University's Biotron facility. After an initial equilibration period, she will use high-resolution microsensor and diffusive gradients in thin-films (DGT) technologies to examine how controlled changes in the temperature and atmospheric CO₂ conditions will affect biogeochemical processes in the sediments, and the bioavailability of trace elements in the overlying water. Ksenia is supervised by Nik Lehto and Naomi Wells (Lincoln University) and Adam Hartland (Lincoln Agritech Ltd.). Her research is part of the wider MBIE Endeavour Research Programme, "Safeguarding te mana o te awa o Waikato from emerging climatic pressures", led by Lincoln Agritech Ltd.

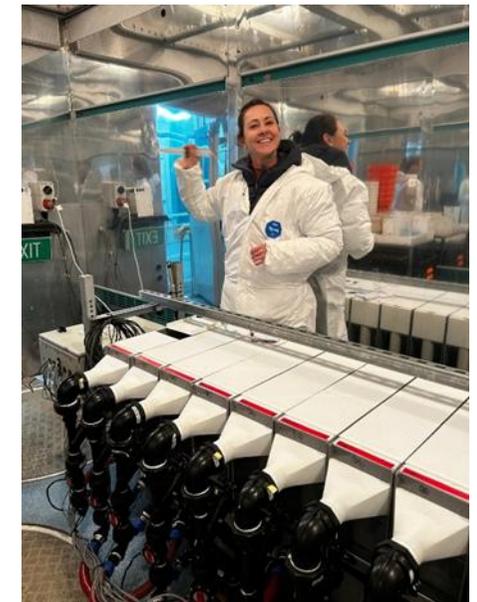


Long distance travel – a sediment's journey from Te Kārapiro to continuous flow mesocosms at Lincoln University | Te Whare Wānanga o Aoraki. In the photos (left to right): Nik Lehto, Ksenia Trifonova, Adam Hartland and Ksenia again in the controlled-environment rooms.

Cultural values of morihana (wild goldfish) in Te Arawa Lakes

As part of [Fish Futures](#), Marc Tadaki led an interview-based study with whānau who have harvested morihana to understand the meanings and histories of cultural connection with the fish. Synthesis of scientific information and historical materials from Papers Past helps contextualise the introduction and spread of wild goldfish across Aotearoa, and interviews with management staff elaborate their current management status. The report presents some specific tikanga and mātauranga that has been developed with morihana and provides a valuable record of the history of why it has been designated as a taonga species by Te Arawa whānui.

Outputs: a Lincoln University report for Te Arawa Lakes Trust, available at <https://hdl.handle.net/10182/19370>



Our Lake, Our Future

Lincoln University now hosts the MBIE Endeavour programme [Our Lakes, Our Future](#), which they co-lead with Earth Sciences New Zealand and Cawthron. The programme brings together a multidisciplinary team spanning 11 national institutes or companies, four iwi, and seven international organisations. It is supporting 23 postgraduate students and four summer students/interns. Student projects span biodiversity, food webs, climate change impacts, eDNA innovation, and the socioeconomics of lake restoration. Many of the projects are co-designed with end users to ensure rapid uptake of findings, for example, PhD student Shreesha Bhattarai (Lincoln University) works with Ashburton District Council and local residents to address cyanobacterial blooms in Lake Hood (Canterbury), while MSc student Mel Whiting (Lincoln University) is working in collaboration with DOC on

assessing the impacts of perch on biodiversity and water quality, and the feasibility of their removal from Lake Denny (Canterbury).

Science highlights this year include demonstrating how extreme storms reshape biological communities along gradients of human impact and showing that biodiversity stability within individual lakes can mask substantial regional losses due to community homogenization, which is challenging how biodiversity data are interpreted. The team's analysis of long-term monitoring data from shallow lakes has demonstrated that relationships between water quality and environmental drivers are non-stationary, shifting with episodic events and over time. Cutting-edge eDNA assays, a multi-lake metagenomic gene catalogue, and a new MetaWeb trophic database are providing unprecedented insights into biodiversity patterns, ecosystem processes and food webs. Further information is available at ourlakesourfuture.co.nz.

The Our Lakes, Our Future team at their annual hui in April 2025.



Lincoln University Select Publications (post 2024)

- Biessy, L., Sissons, J., Kihika, J.K., **Wood, S.A.** and Pearman, J.K., 2025. Microbial adaptations to acidic, nutrient-and metal-rich lakes in Aotearoa New Zealand. *Extremophiles*, 29(2), pp.1-15.
- Pearman, J.K., Sissons, J., Kihika, J.K., Thomson-Laing, G. and Wood, S.A., 2025. Microbial biodiversity and metabolic functioning in sediments of coastal dune lakes on a remote island. *Metabarcoding and Metagenomics*, 9, p.e144128.
- Thomson-Laing, J., Steiner, K., Thomson-Laing, G., Thoms, C., Howarth, J.D., Vandergoes, M.J., Moody, A., Li, X., Reyes, L., Dahl, J. and **Wood, S.A.** 2025. Exploring the historical presence of kākahi (freshwater mussel) in lakes using sedimentary ancient DNA. *Inland Waters*, pp.1-13.
- Dengg, M., Stirling, C.H., **Lehto, N.J.**, Reid, M.R., Safi, K., **Wood, S.A.**, Seyitmuhammedov, K. and Verburg, P., 2025. Trace metals in natural lakes: seasonal variation of manganese, cobalt, nickel, copper and zinc speciation in lakes of different trophic states. *Biogeochemistry*, 168(2), p.23.
- Li X, Newnham R, Vandergoes MJ, van den Bos V, Howarth JD, Rees A, Reyes L, Clowes C, Crouch EM, Gregersen R, **Wood SA.** Insights into the natural and cultural history of *Typha orientalis* (Raupō) in Aotearoa New Zealand. *PLOS Water*. 2024 Sep 25;3(9):e0000240.
- Burns C, Rees A, **Wood SA.** 2024. Predicting distribution and establishment of two invasive alien *Daphnia* species in diverse lakes in New Zealand-Aotearoa. *Biological Invasions*.
- Picard M, Von Eggers J, Brasell KA, Yan D, Klaminder J, Alsos IG, Barouillet C, Cheng Y, Dommain R, Dulias K, Duxbury L, Thomson-Laing G...**Wood SA,** Capo E... 2024. Using DNA archived in lake sediments to reconstruct past ecosystems. 2024. Using DNA archived in lake sediments to reconstruct past ecosystems, Reference Module in Earth Systems and Environmental Sciences, Elsevier
- Weyhenmeyer GA, Chukwuka AV, Anneville O, Brookes J, Carvalho CR, Cotner JB...**Wood SA...**et al. 2024. Global lake health in the Anthropocene: Societal implications and treatment strategies. *Earth's Future*. 12, e2023EF004387.
- Thomson-Laing G, Howarth JD, Atalah J, Vandergoes MJ, Li X, Pearman JK, Fitzsimons S, Moy C, Moody A, Shepherd C, McKay N, **Wood SA.** 2024. Sedimentary ancient DNA reveals the impact of anthropogenic land use disturbance and ecological shifts on fish community structure in small lowland lake. *Science of The Total Environment*. 28:171266.
- Wheeler C, Pearman JK, Howarth JD, Vandergoes MJ, Holt K, Trewick SA, Li X, Thompson L, Thomson-Laing G, Picard M, Moy C, **Wood SA.** 2024. A paleoecological investigation of recent cyanobacterial blooms and their drivers in two contrasting lakes. *Harmful Algae*. 131:102563.
- Tadaki M,** Davis S, Hunt N, and Fort-D'Ath S 2025 A study of the cultural values of morihana (*Carassius auratus*) in Te Arawa lakes. LEaP Report No. 69. Lincoln University, Canterbury. <https://hdl.handle.net/10182/19370>
- Clapcott J, Hoani-Waaki A, Kitson J, Baker M, Eveleens R & **Tadaki M** 2025 Out of sync: transforming environmental monitoring through Indigenous perspectives of time. *Earth Stewardship 2* (3): e70021.
- Challies E, **Tadaki M,** Sinner J, Kilvington M, Tane P, Robb CA, Diprose D, Fluerty P, Greening R, Mason L, Paterson B, Robinson M & Shearer M 2025 In search of water policy nirvana: Examining the role of catchment groups in Aotearoa New Zealand. *Water Alternatives* 18(2): 440-461.
- Sinner J, **Tadaki M,** Kilvington M, Tane P, Challies E & Robb C 2025 Great expectations for collective management: The mismatch between supply and demand for catchment groups. *Ecology and Society* 30 (1): 13. <https://doi.org/10.5751/ES-15613-300113>
- Tadaki M** 2024 Limits to measurement: rethinking the role of monitoring in environmental governance. *Environment and Planning E: Nature and Space* 7(4): 1647-1671.
- Wells, N. S.,** Reshid, M. Y., Hennig, K., Hipsey, M., Huang, P., & Eyre, B. D. (2025). Drainage ditches (“hot spots”) and storms (“hot moments”) define aquatic greenhouse gas (CO₂, CH₄, N₂O) emissions from the land-to-ocean aquatic continuum. *Geophysical Research Letters*, 52(15), e2024GL113326. doi:10.1029/2024GL113326

- Arar, M., Clough, T. J., & **Wells, N. S.** (2025). Enhancing sampling of dissolved N₂O in aquatic systems: Field-deployable automated gas bag collection system. *Limnology and Oceanography: Methods*, 23, 363-375.
doi:10.1002/lom3.10687
- Shanafield, M., Blanchette, M., Daly, E., **Wells, N.**, Burrows, R. M., Korbel, K., . . . Duvert, C. (2024). Australian non-perennial rivers: Global lessons and research opportunities. *Journal of Hydrology*, 634, 130939.
doi:10.1016/j.jhydrol.2024.130939
- Kurosawa, E., **Wells, N. S.**, Gibson, R., Lyons, Z., Kesseli, R., & Oakes, J. M. (2024). To eat or not to eat: novel stable isotope models reveal a shift in carnivory with nutrient availability for aquatic *Utricularia* spp. *Annals of Botany*. doi:10.1093/aob/mcae119
- Hodder-Swain, J.** 2025. Braided rivers need protection for their terrestrial biodiversity too. Blog post for Bioprotection Aotearoa.
<https://bioprotection.org.nz/braided-rivers-need-protection-for-their-terrestrial-biodiversity-too/>
- Tubbeh, R. M.** 2022. Hydraulic Infrastructure Development, Irrigation Governance, and Climate Change Adaptation in the Engineered Colca-Siguas Watershed, Peru [The Pennsylvania State University].
<https://catalog.libraries.psu.edu/catalog/38041570>
- Zimmerer, K. S., **Tubbeh, R. M.**, & Bell, M. G. 2024. Entangled pathways of the Plantationocene: early colonial monocropping, subaltern agrobiodiversity, and aridity in Andalus (Spain) and Coastal Peru. *Journal of Peasant Studies*, 51(3), 624–650.
<https://doi.org/10.1080/03066150.2023.2287679>

Irrigation ditch in glacier-fed Andean Distichia muscoides bogs in the Colca Valley, Peru. Farmers and alpaca herders co-manage the wetland to grow crops and grasses. Glacial retreat threatens the ecosystem and livelihoods reliant on traditional water-sharing arrangements. Photo credit: Ramzi Tubbeh





University of Otago

PEOPLE

It gives me (Ross Thompson) great pleasure to be penning my first newsletter contribution from Ōtākou Whakihu Waka. I arrived in January to take up the position of Dame Carolyn Burns Chair in Freshwater Sciences from my previous role as Director of the Centre for Applied Water Science at the University of Canberra. Those with good memories may recall that I completed my PhD on forestry impacts on streams at Otago in 2001, and I have since been based overseas in Canada and Australia. It is a great pleasure to be back and engaging with freshwater challenges in Aotearoa. Thanks to the many people in NZFSS and beyond who have been so welcoming.

Our new cohort of graduate students is well-established with Alice Gilbert working on **Didymo** (Matthaei/Thompson), Jasmine Lane on **Giant Kokopu** (Closs/Thompson), Ashimi Dilhara (Schallenberg/Thompson) investigating **intermittently closed estuaries**, Charlie Boocock-Yee (Rawlence/Closs) studying **fossil fish** and Hossein Valikhani (Closs/Thompson) working on **galaxiids in Southland**. Grace Fortune-Kelly (Ingram) is continuing her work on **mudfish on Rēkohu/Chatham Islands** and will be joined by Joseph Renwick (Ingram) working on **smelt**. Isaac Davies has been in the news with his work on **non-migratory galaxiids**, and Adam Kitchen has submitted his thesis on **ancient and eDNA in galaxiids** (Rawlence). Karen Mayhew, Ryan Easton and Bryony Alden are all in the final throes of analysis and writing, while Nina Batucan has submitted her PhD thesis on **pharmaceuticals in the environment**. Daniel Zamorano is continuing to work on a range of post-doctoral projects. There is also plenty of freshwater activity in the Waters/McCulloch lab working on **stonefly evolution** and in the Lokman lab on all things **longfin eel/tuna**.

IN THE NEWS

Ryan Easton has contributed to work which has identified large populations of **Gollum galaxias** in Southland. [Read it here.](#)

Hamish Spencer comments on how **galaxiid distributions reflect historical tectonic activity**. [Read it here.](#)

Issac Davies' work is highlighted with **new populations of Clutha flathead galaxias** found. [Read it here.](#)

Ross Thompson and Marc Schallenberg comment on proposals to change **water level management in Lake Hawea**. [Read it here.](#)

FEATURE PROJECTS

Ecological Conditions of Intermittently Closed Estuaries (ICEs)

(PhD, Ashimi Dilhara Kiriwana Gamage),



Supervised by Assoc. Prof. Marc Schallenberg, Prof. Ross Thompson, Prof. Gerard Closs and Dr. Sami Khan (Otago Regional Council).

My research project aims to better understand the ecological conditions of intermittently closed estuaries (ICEs) in Otago and provide useful information to help protect these unique environments. I'm studying the dissolved organic matter (DOM) in these estuaries—looking at where the carbon comes from, whether it's produced inside the estuary (autochthonous, like algae or wetland plants) or brought in from outside sources (allochthonous, like runoff from the land). I'm also exploring how this carbon changes—from dissolved form to particulate form—and how the quality of that particulate organic matter affects the feeding efficiency



and growth of tiny aquatic animals like mysids. Another part of my research looks at the types of wetland plants around these estuaries and how they influence the carbon levels, helping us understand the role of vegetation in shaping estuary conditions. I also plan to investigate macroalgae, which can be a significant source of carbon in the summer, and how nutrients such as nitrogen and phosphorus influence their growth. Finally, I'll examine how estuary features, such as shape, size, depth, and surrounding land use, affect macroalgal cover and overall estuary health.

Ancient Fish and the Lost Lake: Reconstructing New Zealand Miocene Ecosystems with Otolith Geochemistry

(MSc, Charlie Boocock-Yee)

Supervised by: Associate Professor Nic Rawlence, Professor Gerry Closs, Dr. Malcolm Reid, Vertebrate Curator at the Museum of New Zealand, Te Papa Tongarewa, Alan Tennyson



My MSc research investigates how fossil fish ear bones, called otoliths, can be used to reconstruct the lives of ancient fish and the environments they inhabited. Otoliths act like time capsules, preserving chemical signals in daily, monthly and annual rings, similar to trees. Each ring preserves unique chemical signatures that be used to reveal information about the fish's life history, habitat and surrounding environment.

My research focuses on two fossil grayling species from the Miocene-aged Bannockburn Formation in Central Otago: *Prototroctes vertex* and

P. modestus. Their closest relatives, the living Australian grayling and recently extinct New Zealand grayling were both amphidromous, meaning that the adults spawn in freshwater, their larvae then drift downstream into marine environments, and once the larvae grow into juveniles, they migrate back into freshwater for the rest of their lives. Whether the Miocene species followed the same amphidromous lifestyle or were landlocked remains a mystery.

To find out, I'm conducting a novel methodology that has never been attempted with fossil otoliths before. My approach uses representative specimens of all the fish genera within the Bannockburn Formation from the Museum of New Zealand, Te Papa Tongarewa's collections and recent field excavations. These will be polished for incremental analysis, and the fossil otoliths will be compared with modern species

Periphyton Community Assembly at the River Reach Scale (Dr. Daniel Zamorano)

This year, Dr. Daniel Zamorano published interesting research from his recently completed PhD thesis about periphyton community assembly in New Zealand streams. Microalgae are well known for their dispersal ability, moving long distances via water, wind, or attached to peoples' boats and waders. However, their communities still exhibit spatial structure, raising the question of why not all algae species are found in all places. In this study, by running a field experiment on streambeds covered by plastic sheets, University of Otago researchers were able to explore how algae drifting from upstream interacted with the local attached periphyton when a new community was assembled. Results indicated that communities originating from just-upstream algae became similar to control communities over time, indicating the role of environmental selection in shaping assemblages. This project was the first publication from Daniel's thesis, with contributions from Professor Christoph Matthaei, and Dr Travis Ingram. Another manuscript from the thesis has just been accepted for publication, and a third is under revision - stay tuned for more periphyton news!

The paper link is: <https://onlinelibrary.wiley.com/doi/10.1002/ece3.70850>

Zamorano, D., Ingram, T. and Matthaei, C.D. (2025), The Role of Local and Upstream Colonisation in Determining Stream Periphyton Metacommunity Assemblages. *Ecol Evol*, 15: e70850. <https://doi.org/10.1002/ece3.70850>

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RESEARCH ARTICLE

The Role of Local and Upstream Colonisation in Determining Stream Periphyton Metacommunity Assemblages

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Handling Editor: Michaela Schindler, Department of Biology, University of Hull

Keywords: dispersal; periphyton; metacommunity; local communities; New Zealand; freshwater

ABSTRACT

Stream periphyton is an ideal study system for exploring how dispersal shapes community patterns. Few studies have tried to investigate periphyton metacommunities at the reach scale, and studies comparing local versus upstream periphyton propagule sources are lacking. We aimed to address these knowledge gaps by investigating environmental constraints and dispersal sources, including dispersal hypothesis related to periphyton functional guilds. We covered 25-m sections of streambed with plastic sheet cover sheets in three streams in Southern New Zealand, allowing river water to flow over the sheets. Samples on top of these sheets allowed periphyton colonisation only by drifting upstream propagules, while 'control' samples placed directly upstream of the plastic sheets were colonised by local and upstream propagules. We collected samples after 7, 14, and 28 days of colonisation. Response variables included periphyton biomass, community structure, and relative abundances of functional guilds. Control samples showed 1.5–3 times higher cell densities than plastic-cover samples, suggesting that local colonisation is very important for biomass accrual. Periphyton communities on both life types became more similar to each other with time, indicating that environmental filters outweigh effects of colonisation sources. While metric and flagellated taxa showed the ability to reach their preferred microhabitats in all streams, the response of the remaining functional guilds did not follow the expected pattern. We conclude that periphyton community assembly already depends on reach scale connectivity, which results in higher biomass accrual and community structure. These findings suggest that the most-often paradigm in theory to be the principal metacommunity process shaping stream periphyton communities at the reach scale.

1 | Introduction

A metacommunity is a set of local communities that are linked by the dispersal of multiple interacting species (Leibold et al. 2004; Wilson 1992). Community structure depends on locally defined processes (Leite et al. 2004): stochasticity, colonisation, migration, abiotic conditions, competition, facilitation, and predation. Using periphyton community ecology research focused mainly on biotic interactions such as competitive and predation, and the role of abiotic conditions shaping local community structure (Vellend 2010). However, the metacommunity framework has revolutionised the study of migration and colonisation, an important environmental selection strength and determining the role of regional processes in modulating local communities (Urban and Lomolino 2012; Vellend 2010). Together with new techniques to track species movements, such as GPS, stable isotopes, and remote sensing, the last 20 years have brought a new era of research on species migration and its role in modulating communities (Driscoll et al. 2014).

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<https://doi.org/10.1002/ece3.70850>

1 of 15

from the same genera. This will allow us to compare and contrast growth patterns and infer palaeoenvironmental conditions. My focal species, *P. modestus* and *P. vertex*, will undergo trace element analysis via ICP-MS, generating high-resolution geochemical data to provide robust insights into their life histories and the characteristics of New Zealand's Miocene aquatic environments.

Beyond advancing palaeoecological knowledge of New Zealand's Miocene environments, this research could inform modern conservation by showing how fish have adapted to past climate changes, offering valuable insights into how we can better protect their descent species today. The resulting information will aid us in refining palaeoclimate models aiming to reconstructing the ancient Lake Manuherikia ecosystem, improving our understanding of past climates and improving predictions for how our modern climate may change in the future.

Using ancient DNA (aDNA), morphological data and environmental DNA (eDNA) to understand absence of two *Galaxias* species in the Maruia

(MSc Adam Kitchen)

Supervisor Assoc. Prof. Nic Rawlence

Masters student Adam Kitchen has completed his Masters seeking to identify identify the original specimens and locate remaining populations of native *Galaxias* species. A 1965 survey of the Maruia River yielded several *Galaxias*, and some were identified at the time as upland longjaw *Galaxias* (*G. prognathus*) and alpine *Galaxias* (*G. paucispondylus*). *G. prognathus* had not been found that far north, or on the western side of the alpine divide. This was also beyond the known range of *G. paucispondylus*. Subsequent attempts to locate these failed. Electrofishing and eDNA surveys were completed through the Maruia River valley and headwaters. Both showed absence of the two species, and yielded *G. divergens*. Initial morphological study used length measurements to discriminate between the three species in ethanol-preserved specimens. Two more aDNA techniques have been tested, and the original specimens measured and inserted into the morphological dataset to determine which species they group most closely with.

MAJOR EVENTS

Te Hui Pūtaiao O Rēkohu Chatham Island Science Festival 2025

Rēkohu (Wharekauri, Chatham Island) is an island ~700km east of Te Wai Pounamu, rich in freshwater habitat with a rich cultural history. As around 90% of the island is privately owned, carrying out research on Rēkohu inherently involves relationships with local people, who tend to be forward thinking, resilient and deeply connected to their environment. The Chatham Island Science Festival is a community-centred wānanga on Rēkohu. It brings together imi (Moriōri), iwi (Ngāti Mutunga o Wharekauri), landowners and scientists working on the island. This year, Travis Ingram and Grace Fortune-Kelly attended alongside an awesome group of conservationists, geologists, palynologists and volcanologists from across Aotearoa. Travis talked about the undergraduate course *Pacific Field Ecology*, during which 300-level Otago Ecology students carry out independent research projects. Freshwater-themed projects have investigated stream restoration, fish passage and lake salinisation on Rēkohu. Grace shared part of her PhD research on Chatham mudfish, focussing on their distribution, habitat and size - they grow much bigger when tuna (eels) are absent!. The trip also involved outreach with the local schools. Kaingaroa school currently has a total of six primary aged students who saw some mudfish up close and were the inaugural players of a fish migration relay game. We also paid tribute to the much-loved founder of the festival, Distinguished Professor David Johnston of Massey University, who sadly passed earlier this year. Many heartfelt memories were shared from both the local and scientific communities.



OTHER EVENTS

The University of Otago Freshwater Forum, 8th October 2025, Hutton Lecture Theatre, Tūhura Otago Museum.

This *wānanga* provided an opportunity for University of Otago researchers working on all aspects of freshwater science, management and policy to get together and share their research with peers, stakeholders and guests. Because the intention is to encourage informal sharing of knowledge, the focus is on short presentations and long breaks to allow everyone to mingle and chat.



To register to present (University of Otago staff and students only) or attend (all welcome) scan the QR code

The Alpine Lakes Forum 26/27th November 2025, Wanaka

In November WaiWānaka, Otago Regional Council and University of Otago will get together to host the 2025 Alpine Lakes Forum. Bringing together freshwater scientists, policy-makers, environmental practitioners, and community, the Alpine Lakes Forum 2025 explores the health, management, and future of Aotearoa's deep lakes and freshwater ecosystems.

Building on the 2023 Lakes Science Summit, this two-day event blends cutting-edge research with public dialogue and place-based action. Attendees will hear from thought leaders and local voices, while also engaging in hands-on showcases and collaborative discussions.

To express interest in presenting or for more information, REGISTER [HERE](#)

UNIVERSITY OF OTAGO PUBLICATIONS (2025 only)

Almeida, G. S. S., Saito, V. S., Sartori, M., Saulino, H. H. L., da Penha, L. O., & Matthaei, C. (n.d.). Experimental effects of multiple agricultural stressors on diversity and size structure of subtropical stream macroinvertebrates. *Environmental Advances*, 20, 100630.

Batucan, N. S. P., Tremblay, L. A., Northcott, G. L., & Matthaei, C. D. (n.d.). Low concentrations of ibuprofen had no adverse effects on *Deleatidium* spp. mayfly

nymphs: A 7-day experiment. *Environments*, 12(4), 102.

Batucan, N. S. P., Tremblay, L. A., Northcott, G. L., & Matthaei, C. D. (n.d.). Limited effects of chronic exposure to field-realistic concentrations of carbamazepine on *Deleatidium* spp. mayfly nymphs. *Ecotoxicology and Environmental Safety*, 303, 118847.

Berg, A. A., Askew, M., Seersholm, F. V., Verry, A. J. F., Hoelzel, A. R., Welch, A., & Waters, J. M. (n.d.). Postglacial recolonization of the

Southern Ocean by elephant seals occurred from multiple glacial refugia. *Global Change Biology*, 31(3), e70101.

Burns, C. W., Rees, A., & Wood, S. A. (n.d.). Predicting distribution and establishment of two invasive alien *Daphnia* species in diverse lakes in New Zealand–Aotearoa. *Biological Invasions*, 26(8), 2723–2736.

Dewenter, B. S., Hughes, J., Shah, A. A., Bristow, S., Poff, N. L. R., Thompson, R., ... (n.d.). Spatial scale influences relationships between indices of

- organisms' thermal tolerance. *Journal of Thermal Biology*, 104226.
- Fan, A., McCulloch, G. A., & Waters, J. M. (n.d.). Do freshwater insect assemblages in exotic plantations resemble those from native forest? Evidence from environmental DNA. *Restoration Ecology*, e70091.
- Giling, D. P., Broadhurst, B., Dyer, F., Grace, M., Joehnk, K., McInerney, P. J., ... Thompson, R. (n.d.). Season and flow drive productivity of a regulated river. *Ecosystems*, 28(1), 5.
- Hitchcock, J. N., Brooks, A. J., Haeusler, T., McInerney, P. J., Parsons, D. F., ... Thompson, R. (n.d.). Inundation of different river bank heights influences organic matter concentrations and zooplankton abundance. *Limnology and Oceanography*.
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Earth Sciences New Zealand



Earth Sciences
New Zealand

Earth Sciences New Zealand is up and running

It's been a year of change for the science sector, triggered by a Government announcement in January that the seven Crown Research Institutes were to be replaced by four Public Research Organisations. We are now Earth Sciences New Zealand, officially formed on July 1 with the merging of NIWA and GNS Science. Earth Sciences, which will ultimately include MetService, brings together 1500 experts across a vastly expanded array of scientific disciplines all committed to powering a better future through science. The organisation is now grouped into six main science areas: geological hazards, weather and climate hazards, energy, land and freshwater, climate and weather, and oceans. Meanwhile, it's business as usual for our clients as we focus on ensuring there is little disruption to the status quo.

Prof Richard Williams – Earth Sciences NZ Chief Scientist – Freshwater

Richard Williams recently moved from being Director of Research in the School of Geographical and Earth Sciences at the University of Glasgow to Earth Sciences New Zealand, Hamilton. In Glasgow he led a number of interdisciplinary projects on the health of Philippine river systems, investigated river restoration and nature-based solutions, and was co-investigator of GALLANT: Glasgow as a Living lab Accelerating Novel Transformation. Before his ten-year tenure in Glasgow, Richard was at Aberystwyth University where he completed his PhD on modelling braided river dynamics and remained as a lecturer. From the UK, Richard already has New Zealand and Earth Sciences connections. He has had a number of research sabbaticals at NIWA and the University of Auckland. He has also conducted extensive fieldwork on the Rees and Dart Rivers.

"I want to support improving the health of freshwater systems here in New Zealand. By doing that you support their economic functions as well. You generate power safely, provide spaces for communities to interact with local riverscapes, and ensure aquatic systems thrive," Prof Williams said.

Flagship programmes established

Twelve new flagship science programmes have been created in the NIWA business unit with the aim of bringing together experts, partners and technologies to tackle key environmental challenges and deliver solutions to help New Zealand build resilience and manage its environment wisely.

Flagship programmes with a freshwater focus include:

- Future Freshwater: Predicting New Zealand's future water flows for better water management and planning to support water security. Flagship lead Dr Doug Booker
- Healthy Freshwater: Understanding the future of freshwater ecosystems in a changing environment, for improved ecosystem health and water quality. Flagship lead Dr Rick Stoffels
- Aquatic Biosecurity: Protect New Zealand's freshwater and marine environments from pests and diseases now and in the future. Flagship lead Dr Deborah Hofstra.

Learn more at www.earthsciences.nz and sign-up to our regular [Freshwater Update e-newsletter](#)



Feature projects

Ramping up fish passage

During the summer of 2025 Earth Sciences New Zealand, with the support of Australasian Fish Passage Services, constructed five innovative rock ramp fishways at critical instream barriers in Northland, Hawke's Bay and Taranaki.

First trialled in New Zealand on the West Coast in 2023, these robust rock ramps have proven effective at helping inanga and other native fish navigate instream barriers, while also providing flood protection and stream grade control. Their nature-inspired design, featuring large ridge rocks embedded for stability, has attracted wide stakeholder interest, with further ramps planned for installation during the summer of 2026.

The success of these ramp systems, particularly in high-energy rivers prone to flash flooding, demonstrates the effectiveness of good engineering combined with expert knowledge of fish ecology.

Key staff: Paul Franklin, Cindy Baker

- **Outputs:**

Learn more about these fish passage solutions in this [video](#) or on our [fish passage webpages](#)

Robust rock ramps have proven effective at helping inanga and other native fish navigate instream barriers.

Photo credit: Stuart Mackay



Field trial of Bio-Acoustic Fish Fence (BAFF) to deter invasive carp

Earth Sciences New Zealand, in partnership with Nikau Estate Trust, Matahuru Marae and Waikato Regional Council (WRC), is preparing to field test the Bio-Acoustic Fish Fence (BAFF) at the outlet of Lake Ohinewai. The BAFF system uses sound, bubbles, and strobe lighting to create a multi-sensory deterrent aimed at preventing the movement of invasive koi/amur carp (*Cyprinus rubrofuscus*) while allowing native species to pass.

This trial builds on successful lab and open-air flume studies and marks the first real-world deployment of the technology for koi/amur carp control in Aotearoa-New Zealand. To assess the effectiveness of the BAFF, movements of both pre-spawning and feeding-stage carp, as well as shortfin eels, will be monitored over a full year.

Restricting carp access to shallow lakes supports restoration efforts and reduces recruitment, helping to control overall carp abundance in the Waikato region. If successful, the BAFF could be integrated with existing carp traps and deployed at other high-priority sites such as Lakes Waikare and Waahi. This scalable, non-physical barrier offers a promising tool for invasive species control and aligns strongly with regional goals for freshwater ecosystem restoration.

Key staff: Cindy Baker, Peter Williams, Rachel Crawford, Gordon Tieman (WRC)

- **Outputs:** Learn more about the BAFF on our [BAFF webpage](#)

Developing a new eDNA-based Fish Index of Biotic Integrity (eFIBI)

Environmental DNA (eDNA) has emerged as a promising new tool for monitoring freshwater biodiversity. With support from the Ministry for the Environment, Earth Sciences New Zealand has led the development of a new eDNA-based Fish Index of Biotic Integrity (eFIBI). This index improves upon previous approaches by applying a Bayesian negative binomial Generalised

Linear Model to more accurately account for interacting environmental factors, particularly elevation and distance inland. These improvements make the index more sensitive to habitat changes associated with land use impacts.

Earth Sciences New Zealand is actively engaging with regional councils to co-develop a user-friendly Shiny app that will support use of the eFIBI in freshwater monitoring and reporting. This tool is expected to help community groups, landowners, and environmental managers interpret eDNA results.

Key staff: Richard White, Rick Stoffels, Cindy Baker

Understanding lamprey populations in a changing climate

Pouched lamprey (piharau/kanakana) are a culturally significant and Nationally Vulnerable species in Aotearoa New Zealand. Their cryptic, burrowing behaviour makes them difficult to detect, posing challenges for conservation and management. To better understand how lamprey populations are responding to environmental change, Earth Sciences New Zealand is leading a suite of investigations including understanding spawning success, temperature tolerance of larvae, and improving tools for predicting presence and locating populations for monitoring.

Most recently, Earth Sciences New Zealand has developed an integrated model that combines data from multiple detection methods including eDNA, pheromone samplers, and targeted larval (ammocoete) fishing. Each technique offers unique strengths: eDNA provides broad-scale presence data, pheromone samplers target juvenile lamprey, and ammocoete fishing delivers fine-scale resolution of densities. By combining these complementary tools, Earth Sciences New Zealand's model improves predictions of lamprey occurrence across Aotearoa-New Zealand. This work is providing a clearer picture of where lamprey are found and supports more targeted, effective conservation efforts for this taonga species.

Key staff: Cindy Baker, Shad Mahlum, Peter Williams, Michele Melchior, Rachel Crawford

Stopping the gold clam: it's now or never



The spread of the invasive freshwater gold clam (*Corbicula fluminea*) poses a serious threat to native biodiversity, infrastructure, and recreational waters in New Zealand.

A five-year Endeavour-funded programme led by Earth Sciences New Zealand was launched in 2024 to develop effective and culturally attuned management strategies. The programme aims to establish control methods, assess the clam's ecological, social, cultural, and economic impacts, and predict its spread to enable early detection and intervention.

Initial research has concentrated on developing a comprehensive understanding of gold clam ecology and their direct effects. For example, field studies in Lakes Karaapiro and Maraetai have examined the abundance and depth distribution of the clam and native kākahi (freshwater mussels, *Echyridella menziesii*) and lab research has focused on the impacts high densities of clams may have on native aquatic plants. Research also focused on the urgent need to inform management protocols, including the Corbicula Check Clean Dry initiative for MPI. These studies are crucial for protecting New Zealand's aquatic environments by preventing further spread of this invasive pest.

Key staff: Deborah Hofstra, Michele Melchior

- **Outputs:** Learn more by visiting our [programme webpage](#) and signing up to our regular e-newsletter

Field testing Earth Sciences New Zealand's automated detection system for submerged invasive weeds

Earth Sciences New Zealand has developed a new tool and capability for the detection of submerged invasive weeds utilising advances in remote sensing, recognition software and machine learning, initially targeting lagarosiphon (*Lagarosiphon major*). The prototype automated detection module is capable of detecting this high-risk species in near real-time from underwater video imagery. In 2024/25, field testing in South Island waterbodies evaluated detection rates and identified current system limitations under different boat speeds, variable camera distance to target and plant cleanliness. A successful demonstration of the automated detection system at Lake Ōkātina with Ngāti Tarāwhai Iwi Trust in February 2025 has identified further development areas to progress towards operationalisation of the detection system with end-users.

, Gareth Preston

Key staff: Daniel Clements

Outputs: 1News-Te Karere video

https://www.youtube.com/watch?v=UlyMouHsP_c (c. 5:27 min mark)

Below: Real-time detection of the submerged weed lagarosiphon in the Kawarau River.



RotoTurf: methods to accelerate reestablishment of native aquatic plants

Scientists at Earth Sciences New Zealand have developed an innovative method to restore plants to freshwater lakes that have lost their macrophytes using biodegradable mats known as RotoTurf. The mats, made from natural fibres like muka (harakeke/flax) and wool, are used to grow native aquatic plants which are then rolled out onto lakebeds. The mats break down over time, allowing plants to anchor and re-establish ecosystems in otherwise plant-depleted lakes.

Earth Sciences NZ researchers monitor plant growth in cages at Lake Ohiniwai. **Photo credit: Stuart Mackay.**



The project addresses a key challenge in lake restoration - helping plants take root once sediment-inputs and nutrient levels are reduced. RotoTurf trials have shown promising results, and decision-support tools were also developed that can be used to understand whether RotoTurf could help with a restoration project.

RotoTurf is an Endeavour Fund Smart Ideas project, and aims to trigger self-sustaining plant growth, clearer water, and healthier ecosystems in the longer term.

RotoTurf is an Endeavour Fund Smart Ideas project, and aims to trigger self-sustaining plant growth, clearer water, and healthier ecosystems in the longer term.

Key staff: Deborah Hofstra, Mary de Winton, Ben Woodward

Outputs: Learn more by visiting the [Rototurf webpage](#)

Genetic study evaluates invasive alligator weed in New Zealand

Alligator weed (*Alternanthera philoxeroides*) is an aggressive invader of aquatic, semi-aquatic and terrestrial environments worldwide. It is a high-risk species that has the potential to become far more widespread in New Zealand, with escalating impacts and a limited control toolbox available. Cost-effective large-scale alligator weed control is reliant on herbicide application, but different weed control outcomes have been achieved in different countries. A recent study by Earth Sciences New Zealand in collaboration with Mississippi State University and colleagues in Australia examined alligator weed genetics and found three haplotypes present in New Zealand, two of those were present in Australia and seven haplotypes were detected in the USA. This suggests multiple introductions in each country and may provide an explanation for differences in control outcomes. For example, the most common haplotypes in the USA are not the same as those found in New Zealand and Australia.

Key staff: Daniel Clements, Deborah Hofstra

Outputs: Learn more about [alligator weed control](#)

New research reveals groundwater's dominant role in river health

A research collaboration between NIWA and GNS Science (now Earth Sciences New Zealand) has revealed critical new insights into how nutrients and groundwater shape the health of Aotearoa-New Zealand's rivers. Published as sister papers in Hydrological Processes and Frontiers in Water, the studies apply the Bayesian Chemistry-Assisted Hydrograph Separation (BACH) method to data from NIWA's National River Water Quality Network dataset. The findings challenge long-held assumptions about river flow dynamics. Groundwater, both shallow and deep, was found to contribute over 80% of river flow at most sites, even during high-flow events. This highlights the vital role of subsurface water in sustaining river ecosystems, especially during droughts and floods. Nutrient transport pathways were

also clarified. Phosphorus, often bound to sediment, is primarily carried by fast surface flows during storms. In contrast, nitrogen travels mainly through shallow groundwater, making medium flow the dominant pathway for nitrate-nitrite nitrogen across most catchments. Importantly, the studies link nutrient loads and flow contributions to upstream catchment characteristics such as rainfall, slope, land cover, and livestock density. These insights offer a practical framework for targeted land and water management strategies, like riparian planting, wetland restoration, and precision fertiliser use. By combining hydrology, chemistry, and statistical modelling, NIWA and GNS Science have delivered a powerful example of collaborative science driving better outcomes for Aotearoa's rivers.

Key staff: Jing Yang and Channa Rajanayaka

• **Outputs:**

<https://onlinelibrary.wiley.com/doi/10.1002/hyp.70161?af=R>

<https://www.frontiersin.org/journals/water/articles/10.3389/frwa.2025.1584947/full>

Characterisation of climate change impact on flood metrics and flood frequency

Wybrig Baker, a Masters student from Wageningen University in the Netherlands worked with Earth Sciences New Zealand under an internship to study how climate change could affect flood metrics and frequency. These metrics are crucial for engineers designing river infrastructure. The study leverages water resource bias correction techniques developed from CMIP6 data for 15 catchments in New Zealand, as part of a Ministry for the Environment project in 2024. A simple bias correction method, which can even be applied in areas without observational data, has been developed and is validated using statistical analysis with the General Extreme Value distribution. Ongoing work is focused on analysing climate change's effects on flood metrics and frequency, applying 20-year-centered analysis and methods commonly used in regional councils. Both stationary and non-stationary assumptions are being considered in the analysis.

Key staff: Wybrig Bakker, Christian Zammit

Harvesting potential: Advancing high-flow water allocation in Northland and Gisborne

Gisborne District Council and Northland Regional Council, in collaboration with Earth Sciences New Zealand, have completed the first phase of a pioneering project to explore high-flow water harvesting as a sustainable solution for water allocation. The initiative aims to unlock new water sources during high-flow events—offering a promising alternative in catchments where low flows are already fully or over-allocated.

The initial focus has been identifying both the opportunities and challenges of implementing a multi-band high-flow allocation system. Stakeholder workshops and case studies highlighted the potential of high-flow harvesting to support economic development, while also improving environmental outcomes by reducing pressure on low flows. Participants supported the concept of a multi-band system for its flexibility, transparency, and alignment with national freshwater policy. However, they also noted key barriers, including infrastructure costs, data limitations, and the complexity of monitoring and compliance.

The next stage of the project will focus on co-developing and testing allocation options using a structured decision-making framework. This will include broader stakeholder engagement, feasibility assessments, and ecological safeguards to ensure the system is both practical and environmentally sound. By investing in adaptive management, monitoring infrastructure, and cross-regional collaboration, the councils aim to create a robust and future-ready water allocation framework - one that balances economic opportunity with the protection of freshwater ecosystems.

Key staff: Channa Rajanayaka, Doug Booker, Paul Franklin, Rick Stoffels

Rain/Snow Temperature Threshold in the Southern Alps

This study investigates the temperature threshold at which precipitation transitions between rain and snow in the Southern Alps of New Zealand (Figure 1). Using high-resolution observations from Earth Sciences New Zealand Snow and Ice Monitoring Network (SIN), we developed a logistic function that quantifies the relationship between air temperature and precipitation phase.

The results show that the temperature at which rain and snow are equally likely (F (50%) - referred to as the 50% phase transition temperature) is approximately 0.99 °C at hourly and 1.1°C at daily resolution (Figure 2). These values closely align with thresholds used in previous studies in other maritime climates, reinforcing their validity for New Zealand conditions.

These findings will provide an observational basis to support and calibrate hydrological and snow models across alpine regions.

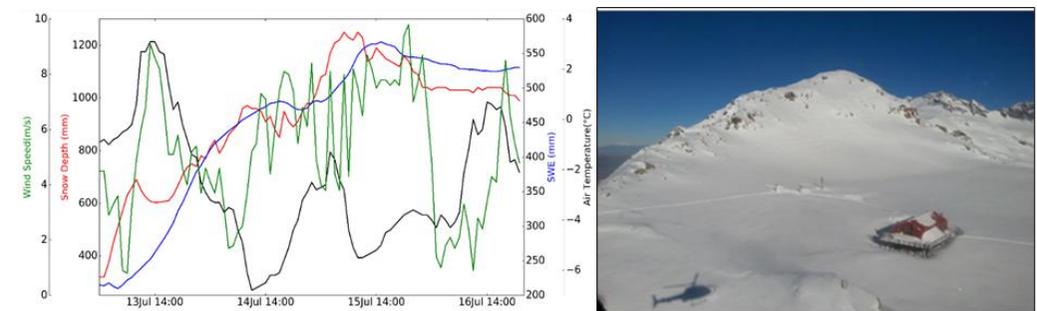


Figure 1: An example of hourly meteorological observations during a snowfall event at Muller Hut: wind speed (green), snow depth (red), snow water equivalent (SWE) (blue), and air temperature (black)

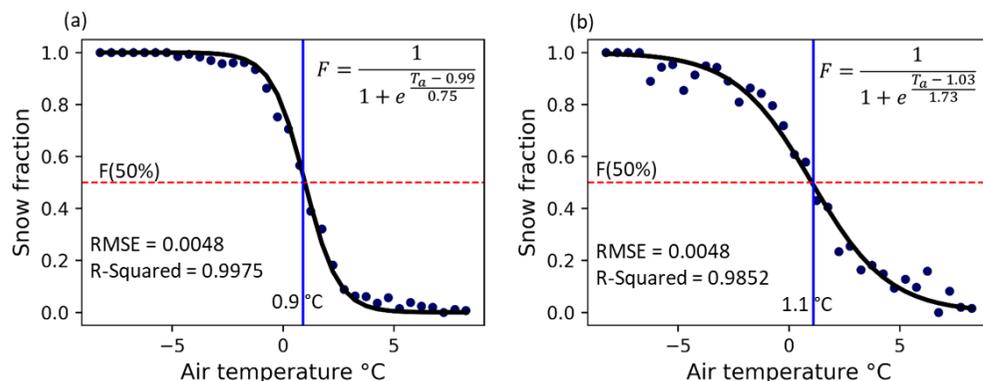


Figure 2: Logistic function fitting for snow fraction as a function of air temperature at hourly (left) and daily (right) resolutions.

Key staff: Rasool Porhemmat and Jono Conway

Understanding rainfall intensity and its impact on Auckland's infrastructure

Recent extreme rainfall events in New Zealand, particularly in Auckland, have raised concerns about the reliability of current rainfall predictions used in infrastructure design. To address this, Auckland Council commissioned Earth Sciences New Zealand to update the intensity duration frequency (IDF) curves, which are crucial tools in hydrology for estimating the likelihood and magnitude of extreme rainfall.

We analysed rainfall data from Auckland up to 2023, including the significant January 2023 Auckland Anniversary weekend event. The results showed that recent extreme rainfall has significantly increased design rainfall estimates, with 100-year rainfall estimates for 6-hour and longer durations now between 30% and 50% higher than previous estimates. We updated our High Intensity Rainfall Design System (HIRDS) model for Auckland, incorporating this new data. The updated model shows higher design rainfall depths, especially in areas north of Auckland, reflecting the impact of recent severe weather.

This analysis highlights the importance of incorporating climate change projections into IDF curves to help engineers and policymakers design infrastructure that can withstand future extreme weather events, ensuring greater resilience for Auckland and beyond.

Key staff: Shailesh Singh, Trevor Carey-Smith, Rasool Porhemmat, Graeme Smart

Monitoring the relative abundance of freshwater eel fisheries using GIS mapping

Freshwater eels are a culturally and economically significant species in Aotearoa-New Zealand, supporting both commercial fisheries and Māori customary practices. However, populations of longfin (*Anguilla dieffenbachii*) and shortfin eels (*Anguilla australis*) have faced declines due to habitat loss, commercial fishing pressure, and barriers to migration. To ensure sustainable management, monitoring their relative abundance is essential, and Geographic Information Systems (GIS) provide a powerful tool for this purpose.

As with other successful fishery management methods, indices of relative abundance can be used to monitor the population. Eel catches reported by fishermen are registered at locations on the REC, where the start and finish coordinates of fishing events are identified and stored. After checking for data veracity, and removing invalid points, GIS tracing methods are used to estimate distances fished along upstream paths using the REC's network connections. Distances are used with mean annual flow widths along streams to determine areas fished. Statistics are then derived from these quantities. Comparisons are made with previous estimates, and relative abundance summaries are produced for the survey period providing information and guidance to MPI for their fisheries management effort.

Key staff: Mike Beentjes and Ude Shankar

Trans-Tasman collaboration advances fish passage innovation

With over 75% of New Zealand's freshwater fish species at risk, instream structures remain a major barrier to recovery. A Royal Society Catalyst Fund grant has enabled Earth Sciences New Zealand to lead a trans-Tasman partnership focused on developing cutting-edge fish passage and screening technologies.

Collaborating with Charles Sturt University, NSW DPIRD, and Australasian Fish Passage Services, the project has seen a successful first year, including joint workshops and research tours across Australia. Highlights include the commissioning of CSU's large-scale flume facility and the adaptation and implementation of proven rock ramp fishways at New Zealand demonstration sites. By leveraging international expertise and research infrastructure, the project will accelerate New Zealand's ability to develop and implement world-class fish passage and screening solutions, significantly improving conservation outcomes for native fish.

Key staff: Paul Franklin, Cindy Baker, Mike Hickford

Earth Sciences New Zealand Key Publications:

Baker, C. F., Mahlum, S., & Rowe, D. K. (2025). Variation in the population structure of bluegill bully (*Gobiomorphus hubbsi*) with distance upriver: implications for river connectivity. *New Zealand Journal of Marine and Freshwater Research*, 1–11.

<https://doi.org/10.1080/00288330.2024.2446744>

Bolland, J. & Franklin, P.A. (2025) A practitioners' perspective on protecting freshwater biota and habitats at flood-relief pumps in New Zealand. *Ecological Management & Restoration*. 26(3), e70020. DOI: <https://doi.org/10.1111/emr.70020>

Crawford, R., Gee, E. M., Hicks, B.J., Franklin, P.A. (2025) Teaching fish new tricks: Repeated exposure to a velocity barrier improves passage performance. *PLOS One*. 20(8): e0329371. DOI: <https://doi.org/10.1371/journal.pone.0329371>

Crawford, R. M., Gee, E. M., Hicks, B. J., & Franklin, P. A. (2025). Group swimming significantly decreases time to passage success for a galaxiid species. *Journal of fish biology*, 107(2), 372–383. <https://doi.org/10.1111/jfb.70040>.

Crawford, R., Gee, E. M., Hicks, B.J., Nolte, D., Dupont, D.W.E., Franklin, P.A. (2025) Accounting for interspecies and intraspecies variation in swimming performance for fish passage solutions. *Journal of Applied Ecology*. DOI: <https://doi.org/10.1111/1365-2664.14828>

Crichton, B.R.J., Hickford, M.J.H., McIntosh, A.R., Schiel, D.R. (2024) Evaluating intra-and inter-life stage density-dependent dynamics for management of perennial amphidromous fish. *Ecological Applications*, 34(8): e3038. <https://doi.org/10.1002/eap.3038>

Franklin, P.A., Bašić, T., Davison, P.I., Dunkley, K., Ellis, J., Gangal, M., González-Ferreras, A.M., Gutmann Roberts, C., Hunt, G., Joyce, D., Klöcker, C.A., Mawer, R., Rittweg, T., Stoilova, V., Gutowsky, L.F.G. (2024) Aquatic connectivity: Challenges and opportunities in a changing climate. *Journal of Fish Biology*. DOI: <https://doi.org/10.1111/jfb.15727>

Franklin, P.A. & Baker, C.F. (2025) Culvert baffle design to improve fish passage for small-bodied fishes: A rapid evidence synthesis. *Conservation Science & Practice*. DOI: <https://doi.org/10.1111/csp2.70082>

Watson, A. S., A. Rose, K. Hogsden, O. Daly, A. Sinton, E. Egan and R. J. Stoffels (2025). Impacts of river flow and thermal regimes on fish-growth dynamics during early life history. *Canadian Journal of Fisheries and Aquatic Sciences*. 82: 1-17. <https://doi.org/10.1139/cjfas-2024-0018>



CAWTHRON

New arrivals

We are pleased to welcome **Ana Zupančič** and **Joëlle Lousberg** who started their PhDs with the **Our Lakes Our Future** team. Ana joins us from Slovenia via the UK, bringing a passion for freshwater life and aquatic invertebrates. Her PhD (University of Waikato) explores **lake food webs** through **fish stomach content** and biodiversity analysis, and she's developing **new eDNA tools** to assess lake health. Joëlle grew up in Belgium and, after falling in love with Aotearoa on a working holiday, has moved to Nelson to take the next step in her science career. With a background in **ecotoxicology**, a love of diving, and a curiosity for new techniques, her PhD (Lincoln University) will investigate NZ's **lake**



Ana Zupančič, Joëlle Lousberg and Simon Stewart sampling on Lake Rotoiti (Nelson Lakes) on a frosty July morning. Credit: Ana Zupančič

zooplankton diversity using a tailored **eDNA assay validated against taxonomy**. We also welcome Lachlan, a baby boy for Lena Schallenberg, and we wonder if he will be a third generation NZFSS member!

Feature Project : Our Lakes, Our Future

Our Lakes, Our Future (OLOF) is a 5-year MBIE Endeavour Research Programme (2024-2029) co-led by Lincoln University, Earth Sciences NZ and Cawthron. Cawthron researchers include Kiely McFarlane, John Pearman, Jonathan Puddick, Lena Schallenberg, Kirill Shchapov, Konstanze Steiner, Simon Stewart, Lucy Thompson, Georgia Thomson-Laing, Jacob Thomson-Laing, Fabio Weiss and Roger Young.

Beyond business as usual

In 2025 our freshie team worked with iwi, industry, and government—co-developing monitoring with iwi and catchment groups nationwide, modelling threatened species for DOC, advising MPI on invasion pathways, and guiding MFE on environmental reporting. Laura Kelly and Roger Young also remain central to delivering annual LAWA updates.

Stepping up

Kati Doehring is driving impactful science communication in her new role as President of the Science Communicators Association of NZ (SCANZ). Joanne Clapcott now leads the executive team as President of NZFSS.

One research strand focuses on how lake food webs respond to environmental change. Using a meta-web approach, the team are mapping interactions among lake organisms across Aotearoa NZ. At Lake Rotoiti (Nelson Lakes), Ana Zupančič's PhD is tracking how food web structure shifts over space and time, combining traditional gut content and isotope analyses with emerging tools such as eDNA, metabarcoding, and CRISPR. To grow this knowledge, the team are seeking donated fish gut samples from lakes nationwide—contact Ana (ana.zupancic@cawthron.org.nz) if you can help.

Another strand is developing holistic, scalable ways to assess lake health using eDNA. The team are optimising monitoring by testing how sample numbers, locations, methods, and timing affect results. They are also expanding the toolkit of species-specific assays for taonga species, adding kōaro, kōkopu, and kōura. Recent studies include mapping kōaro in Lake Chalice and tuna in Lake Moawhitu, with eDNA compared against traditional netting surveys. Seasonal detection is being tested in the Kaihoka Lakes, alongside trials of different collection methods across multiple lakes to find the most effective way to capture biodiversity.

To refine eDNA detection of aquatic taonga species, the team developed a droplet digital PCR (ddPCR) assay for kōura (kēwai, freshwater crayfish, *Paranephrops* sp.). Controlled tank trials then tested kōura DNA shedding and decay rates in water. With support from mana whenua, kōura were collected from Nelson's Brook Sanctuary using whakaweku—a traditional Māori fishing method—and placed in tanks for eDNA sampling. Watch a short video on this work here: <https://ourlakesourfuture.co.nz/new-video-catching-clues-not-waikoura/>

To link this novel science with action, OLOF social scientists are examining the theory, practice, and politics of lake restoration. Their literature review showed that restoration is usually framed in biophysical terms—focused on problems like eutrophication—while paying little attention to social and cultural dimensions beyond community participation. A smaller body of work instead frames restoration as reciprocity, reconnection, sovereignty, or even green capitalism, highlighting the power dynamics that shape whose knowledge and values guide restoration. Building on these insights, the team will analyse recent trends in Aotearoa NZ and work with iwi partners to explore more holistic, Te Tiriti-based approaches.



MSc research intern Elora Vergne collecting wai kōura at the Brook Sanctuary (Nelson) to investigate eDNA shedding and decay rates.
Credit: Konstanze Steiner.

Fish futures

Fish Futures is a 5-year MBIE Endeavour Research Programme (2022-2026) working on understanding human-fish and fish-fish relations, predicting future fish outcomes, and co-developing fish management strategies. Cawthron researchers include Joanne Clapcott, Robin Holmes, Kiely McFarlane, Simon Stewart, Alaric McCarthy, Aisling Rayne, Finnbar Lee, Kati Doehring.

As Fish Futures enters its final year, we're far from slowing down and our focus remains clear: partnering with Māori, honouring community values, and tackling climate and ecosystem challenges to shape thriving freshwater fish futures. We are doing this by combining ecological and social sciences, cultural knowledge, and community input to make better decisions for New Zealand's changing environment.

We've been up to some cool stuff! To help us understand how freshwater fish are valued and managed across Aotearoa, we have worked with Te Arawa, Murihiku and Arowhenua Rūnanga and Fish & Game NZ

to carry out national and regional surveys on angling, recreation and mahinga kai. We held a wānanga series, revitalising mātauranga around fish species and captured those wānanga on videos for generations to come. We have also examined the complex social-ecological feedbacks that influence freshwater fish management and developed guidance on species belonging to inform the management of introduced and new species.

To predict future freshwater outcomes, our University of Canterbury team have developed and refined fluvial geomorphology models that allow users to track change in river corridors and macro habitats. This modelling is facilitating the exploration of fish species distributions and dynamics in braided rivers under changing climatic conditions. Our work continues to delve into the complex challenges of conserving native species, for example, informing isolation management strategies with DOC and regional councils, and kōura habitat

restoration in Rotorua Lakes. Fish futures students and early career researchers are leading the way, including guest editing an upcoming special issue for NZJMFR.

And we also want to share the fun! So, we have been experimenting with engagement methods to build stronger human-fish relations. Whether it's through 3D-printed fish, paper-craft kōura, talking fish, social media, or science fairs, we aim to make freshwater science creative, inclusive, and engaging. To learn more, visit our website (www.fish.futures.co.nz) and follow us on Instagram.



*Talking fish' at the NZFSS conference as part of the Fish Futures exploration of transformative research methods. Credit: **Fish Futures.***

Rewilding our rivers

This Marsden-funded project is now in its final year, with three exciting components coming to a close for Simon Stewart and Robin Holmes. The Waituna Creek study—quantifying the role of lagoon-derived īnanga in supporting upstream longfin eel populations—has been completed and submitted. At this year’s NZFSS conference, Simon will present his analysis of historic longfin eel otoliths from Te Waihora, shedding light on the impacts of lake degradation. The third strand of work focuses on how wetland restoration enhances īnanga production. This has been explored through studies in Nelson streams, comparing sites with and without wetlands, and will soon extend to a summer project at Victoria University, where a student will analyse īnanga otoliths collected from these streams.

Science and storytelling

The Cawthron freshwater team is finding new ways to connect people with rivers, lakes, and wetlands through creative science communication.

As part of the Te Pūnaha Mātātini storytelling community of inquiry, our researchers—led by Kati Doehring—worked with illustrator Jean Donaldson to craft a visual [story on changing land stewardship](#). The project highlighted how creativity and cross-disciplinary collaboration can spark new conversations about restoration.

At the International Science Festival in Ōtepoti Dunedin (July 2025), the team showcased Fish Futures with a kōura-themed exhibit in partnership with Te Arawa Lakes Trust. Featuring 3D-printed native fish, paper-craft kōura, and hands-on activities, the exhibit captured the imagination of kids, families, and curious

minds of all ages. You can catch highlights on the [Fish Futures website](#) under *What’s New*.

Our researchers also worked alongside five Northland hapū through Ngā Kaitiaki o Ngā Wai Māori, helping them build skills in ArcGIS mapping and reporting to strengthen their freshwater restoration efforts. Their [Storymap](#) is a brilliant example of how mātauranga can help restore our awa.

These projects sit alongside many other outreach efforts—infographics, short films, co-designed workshops, and interactive online tools—all aimed at making freshwater science engaging,



Kati Doehring and Soweeta Fort D’Ath (Te Arawa Lakes Trust) at the NZ International Science Fair in Dunedin. Credit: Fish Futures

relevant, and impactful.

New guidelines to keep swimmers safe from toxic algae

Cyanobacteria—often referred to as toxic algae—pose growing health risks in Aotearoa New Zealand’s rivers and lakes. To help protect people using these waters for recreation, an updated version of the [Aotearoa New Zealand Guidelines for Cyanobacteria in Recreational Freshwaters](#) has just been released. Originally developed in 2009 as an interim guide, the new 2024 edition

reflects years of work by scientists and agencies across the country and internationally. The revised guidelines provide strengthened advice for managing planktonic cyanobacteria, drawing on updated World Health Organization guidance and the latest research on toxin-producing species in New Zealand.

New sections cover best-practice communications, integration of modern technologies into monitoring programmes, and practical tools to support on-the-ground decision-making. Additional appendices offer resources to help manage emerging risks and areas of concern. This revision was led by a collaboration between Cawthron, ESR, NIWA, Griffith University (Brisbane), local councils, public health units, and government agencies.

He Paku Ā Uta, He Paku A Rō Wai

Funded by the Vision Mātauranga Capability Fund (VMCF) and in collaboration with the NZFSSRC (New Zealand Food Safety Science and Research Centre), Cawthron has been working with Whakakī Lake Trust to evaluate food safety concerns related to cyanotoxin accumulation in the highly prized tuna (eels) from Whakakī Lake.

The project name 'He Paku Ā Uta, He Paku A Rō Wai' comes from a whakataukī that exemplifies the importance of mahinga kai as a source of sustenance.

The project utilised mātauranga-ā-hapū and science to better understand toxin accumulation in tuna from Whakakī Lake and assess the potential risk this poses to people eating tuna harvested from the lake.

Over two years, lake water and tuna samples were collected and analysed for toxins (nodularins and microcystins) produced by cyanobacteria that bloom in the lake during summer.

Toxin detection in lake water samples was also assessed using an onsite testing method (similar to a COVID RAT test, but for toxins), to enable the Whakakī community to independently evaluate samples for toxins. A survey to better understand tuna consumption rates was co-developed with trustees from Whakakī Lake Trust and sent out to people in Whakakī and the Wairoa region.

Results from the work showed that while there were periods when toxins were present in tuna, there were also periods when toxins weren't detected. The onsite testing for microcystins / nodularins was able to reliably detect toxins in the lake water and provides an early warning mechanism for when toxin-producing cyanobacterial blooms are present in the lake. The survey provided useful insights into tuna consumption patterns amongst a rural Māori community (including likely portion size, frequency of consumption and preparation methods) and indicated that consumption of tuna is declining for a range of reasons.

Stressed: Using metagenomics to identify stressors impacting lakes

Lakes are under unprecedented pressure from a multitude of natural and human influences. Understanding how microbial communities—key drivers of biogeochemical cycling—respond to these pressures is essential for managing lake health.

A research team led by John Pearman, with MBIE Endeavour Smart Ideas funding, is investigating the functional potential of lake

microbial communities on a national scale. Using metagenomics of lake surface sediments, the team has built a unique database spanning more than 150 lakes and containing over 60 million annotated DNA contigs (DNA segments with known functions). This powerful resource provides insights into the metabolic functions of lake microbes and helps identify genes that signal the impacts of anthropogenic stressors contributing to the degradation of Aotearoa New Zealand's lakes.

Recent publications include a study of the coastal dune lakes of the Chatham Islands (Pearman et al. 2025) and an assessment of extreme lakes in the Tasman region (Biessy et al. 2025). Together, these outputs demonstrate the potential of genomic approaches to better understand and safeguard our lakes.

Freshwater invasions

"It's only a matter of time..."

That's becoming a common refrain in response to warnings that climate change and global connectivity are increasing the risk of freshwater invasive species. The gold (or Asian) clam is our latest arrival. *Corbicula fluminea*, native to eastern Asia, was first detected in the Waikato River in May 2023. Less than a year later, in March 2024, a second species—*Corbicula australis*, native to Australia—was found in a nearby aqua-park. In both cases, the presence of large, mixed-age populations suggests the clams had been present for years before detection. Surveys have since confirmed that *C. fluminea* is far more widespread in the Waikato than first thought.

Globally, *Corbicula* clams are known as ecosystem engineers: they tolerate a wide range of conditions, reproduce rapidly, clog

hydropower infrastructure, and thrive in environments with little natural competition—traits that make them a serious threat to Aotearoa New Zealand's freshwater ecosystems. Early warnings suggest this could be the most damaging freshwater animal invasion yet. The long-term impact will depend on how well we contain its spread. Initial efforts include a management strategy focused on containing the clam within the Waikato catchment, alongside long-term surveillance. More details will be available in an upcoming article in *BioInvasions Records* by MacNeil et al. (see Publications section below).

Meanwhile, researchers at Cawthron are working on several fronts:

- Modelling the potential [habitat suitability of invasive clams](#) across Aotearoa
- Refining [eDNA assays](#) for early detection of non-native species
- Trialling a [biocontamination index](#) to better guide freshwater management decisions

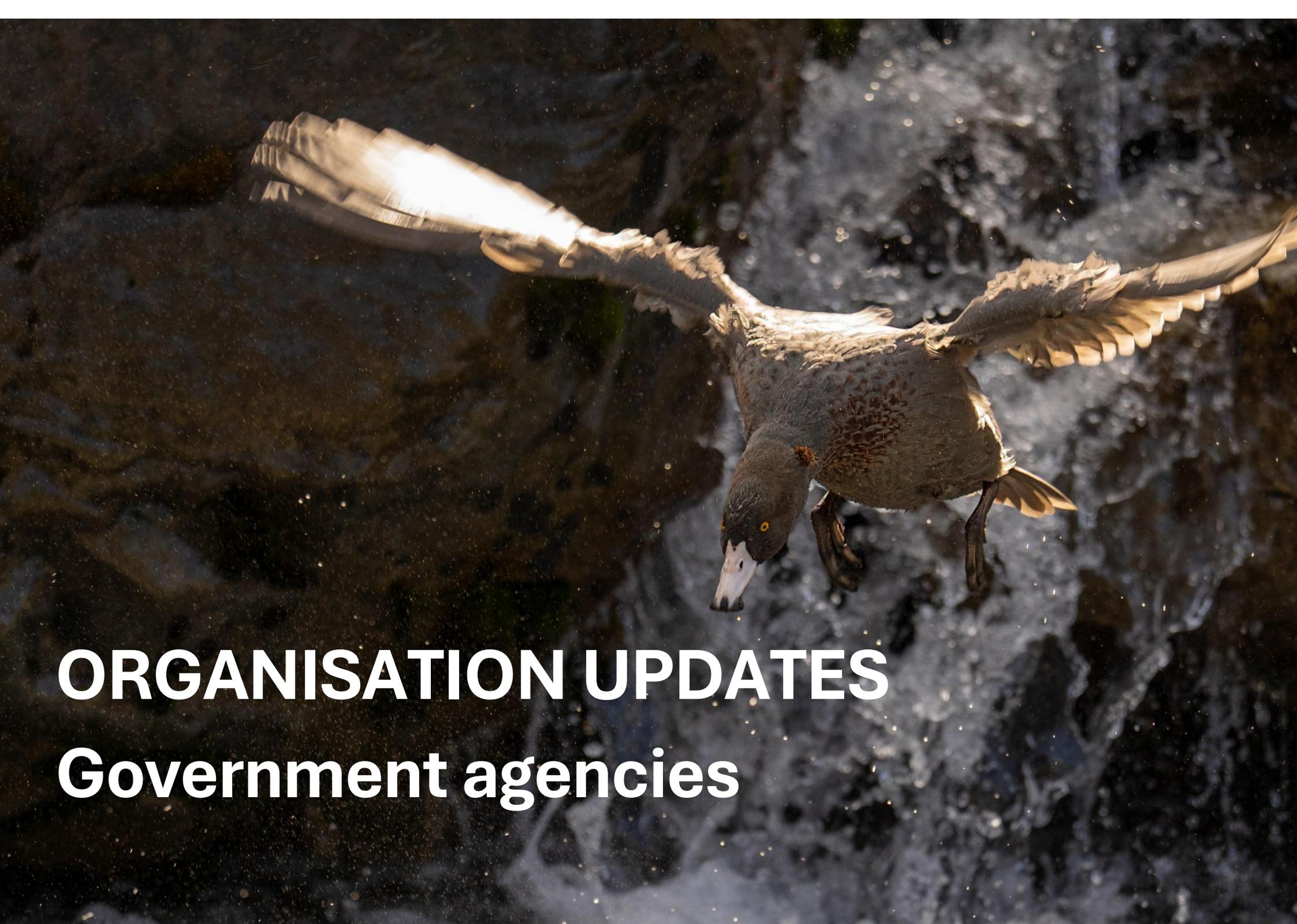


A typical range of size classes (5-15mm) of *Corbicula fluminea* from the Waikato River. Credit: **Ministry for Primary Industries (MacNeil et al., in press).**

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ORGANISATION UPDATES

Government agencies

Policy and Planning Update: Advancing Freshwater Initiatives

Northland Regional Council's Policy and Planning team continues to make significant strides in freshwater management, working closely with Te Tiriti partners and key stakeholders to address pressing environmental challenges. Engagement remains strong with both the Tangata Whenua Water Advisory Group and the Primary Sector Liaison Group, as collaborative efforts focus on critical freshwater issues across the region. Recent initiatives include a series of on-farm site visits and workshops aimed at exploring and evaluating options for stock exclusion provisions, supported by a robust evidence base.

A major development is the creation of a new wetland mapping tool, designed to enhance the accuracy of existing maps and support the establishment of a comprehensive wetland inventory, as required under the National Policy Statement for Freshwater Management (NPS-FM). The team is currently validating GIS layers before making them publicly accessible.

In parallel, work is underway to support the rollout of the Freshwater Farm Plan regulations. This includes the development of a GIS viewer and supporting documents that provide catchment context, identify challenges, and highlight values for three Freshwater Management Units (FMUs).

Another key project involves partnering with Ngāti Hine to develop a business case aimed at improving freshwater quality and the health of the receiving coastal environment in the Taumarere Catchment, particularly the Kawakawa River. This business case is expected to be finalized in August.

The team is also progressing the development of a fish passage action plan, which will contribute to the broader goal of restoring aquatic ecosystems and improving biodiversity outcomes.

Meanwhile, the Regional Plan for Northland is now at full implementation, and has just gained final approval from the Minister of Conservation for the coastal provisions.



Despite these advancements, the team faces several challenges. The scale and complexity of ongoing changes to national policy direction and the Resource Management Act (RMA) have introduced significant uncertainty into freshwater planning. Keeping council members—and where possible, Te Ruarangi members—informed of these developments, and ensuring timely feedback to government within often tight deadlines, remains a demanding task.

Implementation of the Regional Plan has also revealed compliance issues, particularly around wetlands, burning, and stock exclusion rules. These challenges often stem from limited landowner awareness and the complexity of interpreting regulatory requirements.

The new inanga spawning sites have been mapped at <https://localmaps.nrc.govt.nz/LocalMapsGallery/>

The policy team working closely with tangata whenua, farmers and primary sector reps.



Northland's Lakes: Biodiversity Boosts and Water Quality Monitoring

Northland Regional Council's Lakes Biodiversity and Water Quality team is continuing its vital work to protect and enhance the region's unique dune lakes, many of which are home to threatened species and hold deep cultural significance for iwi and hapū. Led by Jacki Byrd and Suha Sunwar, the team has been actively supporting iwi, hapū, and landowners with a range of biodiversity initiatives. These include aquatic pest plant control, fencing, pest animal management, pine removal, native plant supply, and educational resources.

Among the recent highlights was a **Wai Mauri wānanga** held at Lake Wahakari in collaboration with Te Rūnanga Nui o Te Aupōuri, fostering knowledge sharing and community engagement. Hornwort, a highly invasive aquatic weed, was successfully controlled at four lakes with the support of mana whenua, while approximately **35 kilograms of *Egeria densa*** were removed from Lake Rotokawau on the Poutō Peninsula. At Rototuna, **Te Uri o Hau Environs kaimahi** carried out weed control as part of a pine removal and replanting initiative.

To empower iwi in their own lake health monitoring efforts, lake monitoring kits were gifted to several groups. The council also supported **Te Roroa and Te Kuihi kaimahi** at the Check Clean Dry station at Lake Taharoa over summer, where they inspected all watercraft for the invasive gold clam (*Corbicula fluminea*).

The council continues to implement its recently reviewed lake monitoring network, which includes monthly monitoring of 15 lakes. In response to updated national guidelines, Northland's cyanobacteria monitoring framework is being revised. Discussions with laboratories are ongoing, with a new automated alert system expected to be in place by next summer. This system will notify stakeholders of orange and red alerts based on preliminary results. While toxins such as **Anatoxin-a**, **Cylindrospermopsin**, and **Microcystins** are present in Northland, no red alerts have been triggered to date. **Microcystis spp.** remains the dominant toxin-producing species in the region, while **Cuspidothrix** has only been detected once.

A recent study commissioned by the council has also shed light on internal phosphorus (P) loading in Lake Ngatu, a Northland dune lake. Data from the national **Lake380 project** revealed that while dune lakes vary in their bioavailable phosphorus levels, Lake Ngatu's sediment appears to buffer the lake from the impacts of elevated nutrient loading. This may be due to naturally high aluminium content in the lakebed sediment, which helps bind phosphorus and reduce its release during anoxic events or wind-induced mixing.

Despite these positive developments, challenges remain. Many of Northland's dune lakes are in fair to poor condition and are highly vulnerable to



Lagarosiphon or South African oxygen weed has officially been declared eradicated from the Far North's Lake Ngatu five years after the entire lake was treated with herbicide to control it, Oct 2025.

climate change due to their lack of major inflows and outflows. Limited resources continue to constrain on-the-ground restoration efforts. Additionally, ongoing uncertainty around the National Policy Statement for Freshwater Management (NPS-FM), Resource Management Act (RMA) reforms, and other national direction packages adds complexity to planning and implementation.

More information about lagarosiphon/oxygen weed and how to control it is available at: www.nrc.govt.nz/pestcontrolhub

More information about gold clam is also available at: www.nrc.govt.nz/pestcontrolhub

You can learn more about the council's lakes projects at: www.nrc.govt.nz/dunelakesproject

Northland Rivers Under Pressure: Monitoring, Resilience, and Ecological Insights

Northland's rivers are facing increasing pressure from climate extremes, land use, and ecological stressors, as highlighted in recent work by the Northland Regional Council's River Water Quality and Ecology team. Led by Manas Chakraborty, Hadyn Butler, and Ricky Eyre, the team has been actively monitoring and responding to a range of environmental challenges across the region's freshwater systems.

This past summer, Northland experienced drought conditions similar to other parts of the North Island. Prolonged low flows led to prolific

growth of periphyton and macrophytes, with dissolved oxygen (DO) levels dropping for several days. Water temperatures remained elevated, hovering between 20–23°C from December through March—conditions that can stress aquatic life and alter ecosystem dynamics.

A key focus for the team is the upcoming **State of the Environment (SOE)** reporting for freshwater domains, which includes lakes, rivers, and groundwater. A draft report is expected by the end of the calendar year.

In the Northern Wairoa catchment, a preliminary investigation into elevated aluminium concentrations revealed that high total aluminium levels (10–34 g/m³) are likely a natural result of the region's soil chemistry and geology, particularly during heavy rainfall events that cause sediment runoff (TSS: 400–1300 g/m³). Fortunately, most of the aluminium remains bound to sediment particles and is not in a dissolved form that would be bioavailable to aquatic life. The pH of affected samples remained within the typical range for Northland rivers (6.5–8), suggesting a low risk of aluminium toxicity.

Looking ahead, the council has launched a new **climate resilience project** through the Envirolink-funded MAG initiative. This project aims to assess the resilience of Northland's freshwater ecosystems—including rivers, lakes, and wetlands—under climate projections downscaled for Aotearoa from the IPCC's Sixth

Assessment Report. The final report is expected within the current financial year.

Fish monitoring during the 2023/24 season revealed a concerning trend: while adult fish were abundant, juvenile recruitment appeared disrupted, likely due to downstream fish passage barriers. Despite high Fish Index of Biotic Integrity (IBI) scores at many sites, these did not reflect the poor habitat conditions and connectivity issues downstream. Threatened species observed included *Gobiomorphus hubbsi* (bluegill bully), *Galaxias maculatus* (inanga), *Galaxias brevipinnis* (kōaro), *Anguilla dieffenbachii* (longfin eel), and *Cheimarrichthys fosteri* (torrentfish). Notably, *Galaxias postvectis* (shortjaw kōkopu) was absent from this year's survey.



To better understand sediment dynamics, the team is developing a **Sediment Process Attribute Layer (S-PAL)**. This geospatial tool uses high-resolution LiDAR (1m) and airborne gamma-ray radiometric data (50m) to map highly erodible land and landscape instability. It will help identify areas most vulnerable to erosion and sediment delivery to waterways, regardless of vegetation cover or mitigation efforts.

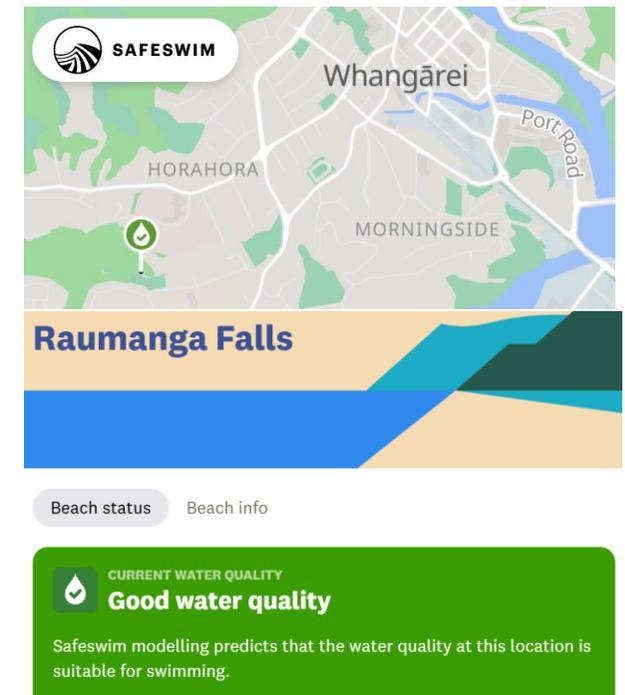
The council continues to implement its updated river monitoring network, which now includes 48 sites. Plans are also underway to expand ecological monitoring through revamped Rapid Habitat Assessments (RHA), Stream Ecological Valuation (SEV) surveys at reference sites, a threatened species monitoring plan, and increased use of eDNA to complement traditional field surveys.

Since 2021, continuous water quality monitoring—tracking DO, temperature, and turbidity—has been integrated into the SOE network, despite being resource-intensive. Additionally, the **Safeswim platform**, a joint initiative with Auckland Council, Surf Life Saving NZ, and others, was successfully used for a second summer to provide real-time recreational water quality information.

However, several challenges persist. Uncertainty around the National Policy Statement for Freshwater Management (NPS-FM), National Objectives Framework (NOF) attributes, and Resource Management reforms complicates planning. Much of Northland's freshwater

environment is dominated by lowland catchments with intensive pastoral land use, resulting in fair to poor water quality—particularly for sediment and *Escherichia coli*—and degraded ecosystem health. Climate change is further exacerbating these pressures, threatening the region's vulnerable taonga species.

Limited resources, damaged road networks from extreme weather, and restricted landowner access are making long-term monitoring and expansion into unmonitored catchments increasingly difficult. Despite these hurdles, the council remains committed to protecting and restoring the health of Northland's rivers.



Smart Tools and Strategic Planning: Northland Advances Water Allocation Management

Northland Regional Council (NRC) is making significant progress in modernising its approach to water allocation, with a suite of tools and collaborative projects aimed at improving water use efficiency and sustainability across the region.

A major development is the upgrade of NRC's **Water Allocation Tool (WAT)**, which integrates ArcGIS and Python scripting to provide a more accurate and dynamic accounting of regional water quantity. The tool estimates both consented and permitted water takes and provides an indicative view of water availability for allocation, helping to guide decision-making and ensure sustainable use.

In partnership with Gisborne District Council and NIWA, NRC is also developing a **High Flow Harvesting (HFH)** framework. A recent workshop with other councils explored the practicalities of implementing HFH for water allocation. The next phase will involve testing and monitoring HFH through case studies in both Northland and Gisborne.

Catchment-specific assessments are also underway. A recent analysis confirmed that the **Ōtaika catchment** remains fully allocated under the Proposed Regional Plan for Northland (PRPN), despite relatively low actual water use. However, the ability to assess impacts on

instream values is limited, as monitoring is conducted near the catchment outlet while most water takes occur upstream. A similar assessment is currently being carried out for the **Waitangi catchment**.

NRC is also contributing to a **Ministry for Primary Industries project** to redevelop the IrriCalc irrigation tool. This initiative aims to close the gap between consented and actual water use by updating crop, climate, and soil databases, and improving the soil-water modelling system to enhance irrigation efficiency.

Looking ahead, NRC is initiating a project to **reassess regional flow statistics** and explore the use of improved water use records to “naturalise” flow data—removing the influence of human abstraction to better understand natural flow regimes.

Wetland Protection in Focus: Restoration, Regulation, and Resilience in Northland

Wetlands remain a critical focus for Northland Regional Council (NRC), which continues to support restoration efforts, threatened species protection, and national policy development—despite facing ongoing challenges.

NRC has been actively providing **wetland restoration advice** to landowners and tangata whenua, including guidance on the creation and enhancement of wetlands. This work has also

supported the **Kaeo Flood Scheme**, where wetland restoration is being considered as part of the consenting process to improve flood resilience and ecological outcomes.

The council's **wetland threatened species programme** is helping to build knowledge and protection strategies for species such as the **Australasian bittern (*Botaurus poiciloptilus*)** and **mudfish (*Neochanna spp.*)**—both of which rely on healthy wetland habitats for survival.

At the national level, NRC is contributing to a **sector-wide work programme** in collaboration with the Ministry for the Environment (MfE) and other councils. This work is focused on refining national standards and regulations for wetlands, and understanding the implications of proposed changes.

However, the region continues to face significant challenges. **Ongoing wetland degradation**—driven by drainage and land clearance—remains a major concern. Implementing wetland regulations to prevent further loss is proving difficult, particularly given the **limited capacity within council** to provide ecological advice for compliance and enforcement. Added to this is the **uncertainty surrounding changes to freshwater regulations**, which complicates long-term planning and investment in wetland protection.

Despite these hurdles, NRC remains committed to safeguarding Northland's wetlands as vital ecosystems that support biodiversity, water quality, and climate resilience.

NEW STAFF

New additions to staff include NZFSS members Dr Nadia Dikareva, Graham Surrey and Dr Jenni Gadd.

ORGANISATION UPDATE

The Environmental Evaluation and Monitoring Unit (previously known as RIMU) was restructured last year and has just celebrated 12 months in the new division of Council. In the first 12 months there was continued work related to NPS-FM implementation, though that eased at the start of 2025 as we turned to analyses and reporting for the 2025 State of the Environment report – release date 11 September. Sadly, by the time you read this we will have farewelled Dr Janine Kamke, Senior Water Quality Scientist who is moving out of Council and into the world of consulting.

Kaimahi from Ngāti Whātua Ōrākei and Te Kaunihera o Tāmaki Makaurau/Auckland Council access Te Waihorotiu – buried under Queen Street in central Auckland. Photo credit Shaideigh Pako



FEATURE PROJECTS AT AUCKLAND COUNCIL

Connecting with Awa: Collaborative Monitoring

Ngāti Whātua Ōrākei are currently delivering Te Whakaorangatanga o te Wai, an ambitious programme of kaupapa that will collectively work towards their vision for Wai within Te Kahu Tōpuri o Tuperiri. That the Wai flows clean, clear and true, that the moana teems with life and vitality, and that their people are actively integrated with an enduring and regenerative relationship with Papatuanuku, Tāne Mahuta, and Tangaroa.

As part of this, kamahi from Ngāti Whātua Ōrākei and Te Kaunihera o Tāmaki Makaurau/Auckland Council (Environmental Evaluation and Monitoring Unit and Healthy Waters kamahi) are collaborating to re-connect whānau with their awa. Initial work has involved re-locating awa both above and below ground, designing a monitoring plan to assess the Mauri current ecological conditions, and identifying accessible sites for Ngāti Whātua Ōrākei members to visit.

Ngāti Whātua Ōrākei and environmental specialists from Te Kaunihera recently went on a hikoī to visit three urban awa: Te Waihorotiu, Te Ako o Te Tūi, and Waipapa. At each awa, Ngāti Whātua Ōrākei shared tribal hītori, speaking of connection and the landscape context of these sites.

Whānau undertook Mauri assessments that were indicators of stream health. They captured things such as whether people would feel safe to swim or drink from the awa, whether it provides sustainable kai resources, and whether they can sense the wai through feel, sound, and smell. The hikoī opened up kōrero, with kaumātua sharing knowledge of the sites and reflecting on how environmental changes have altered their relationship with, and impacted their ability to harvest, live with, and use these waterways.

Te Kaunihera took eDNA and *E.coli* samples from each site to support the data shared by whānau. Early investigations have already proven valuable, identifying a misconnected wastewater pipe that will be remediated. eDNA analysis is still underway, and further ecological monitoring, including stream ecological

valuations and macroinvertebrate sampling is planned for multiple sites next summer. For Ngāti Whātua Ōrākei, this mahi is far more than data collection, it is a cultural reconnection. These results, combined with the cultural assessments, will contribute to a more holistic understanding of the current ecological and cultural health of these awa. Ultimately, these investigations will be used to support the regeneration of these awa. In the broader frame it is about fostering resilience, increasing biodiversity, restoring habitat, regenerating both kai and cultural materials systems. It ensures the tribe will once again reinstate its people to their native and natural role as kaitiaki, exercising their ahi-kā in, with, of and for their taiao. These outcomes will benefit all the community.

See news below :

<https://ourauckland.aucklandcouncil.govt.nz/news/2025/08/nwo-wai-programme/>

Fish monitoring

Continuing on from the three-year pilot programme for NPS-FM freshwater fish monitoring that was initiated in 2022 and carried out under contract by Morphum Environmental, Auckland Council staff brought the programme fully in-house for the 2025 field season. This involved Environmental **Specialists Jazmyn Meiklejohn, Chris Drake, and Natalie Gilligan** upskilling in the intricacies of electric fishing, trapping, spotlighting, and fish ID, which they took to with gusto. A total of 14 sites were fished in the 2025 season, with ten different species recorded.

Water Quality and River Ecology Data Explorer

We have released a new online tool to enhance access for Aucklanders to view water quality and stream ecology data collected at many sites across the region. The Water Quality and River Ecology Data Explorer provides an interactive summary of water quality and freshwater ecology data covering Tāmaki Makaurau rivers, lakes, groundwater, and the coast.

Previously, our annual reporting for water quality was delivered as reports. The water quality scientist team identified a need to change the way we deliver our data and annual reports – and developed the interactive data explorer. The tool is also part of a commitment to continually improve access to council data, adding transparency and enabling the wealth of data we have to be shared with our community and colleagues (including those in NZFSS). Students, consultants and researchers will find a wealth of information about water quality in Auckland reaching back several years.

The data explorer allows users to compare water quality and ecology data across the region on maps, use interactive boxplots to compare between locations, and to

view the data over time. The data explorer is publicly available on the council’s [Environmental Data portal](#), along with detailed guidance on what is displayed so users can see how to use the data explorer. The data explorer has the added benefit of automating analysis and reporting of data, freeing up our water quality scientists to use their expertise in more investigative work and contribute their expertise across the council.

Outputs: <https://environmentauckland.org.nz/Data/Dashboard/456>

RECENT PUBLICATIONS

Atoa J. 2025. Lake water quality state and trends in Tāmaki Makaurau / Auckland 2014-2024. Auckland Council State of the environment reporting. 2025/11.

Buckthought L. 2025. Groundwater quality state and trends in Tāmaki Makaurau/Auckland 2017-2024. Auckland Council State of the environment reporting. 2025/21. Ingleby R, Dikareva N & Gadd J. 2025. River water quality current state and trends in Tāmaki Makaurau/ Auckland 2024. Auckland Council State of the environment reporting. 2025/20.

Surrey G. & Storey R. 2025. River ecology current state and trends in Tāmaki Makaurau/Auckland 2024. Auckland Council State of the environment reporting. 2025



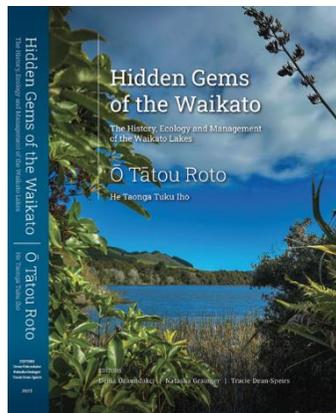
Kaimahi from Ngāti Whātua Ōrākei undertake mauri assessments at Te Waihorotiu. Photo credit Shaideigh Pako

Waikato



REGIONAL COUNCIL

Te Kaunihera ā Rohe o Waikato



Hidden Gems of the Waikato

Book release: The University of Waikato and Waikato Regional Council have recently published a book on the Waikato lakes; Hidden Gems of the Waikato – Ō Tātau Roto. Edited by Deniz Özkundakci, Natasha Grainger and Tracie Dean-Speirs, the book covers a range of perspectives on the lakes from 82 authors, showing a truly collaborative

effort. Hidden Gems provides a deep insight into the Waikato lakes that contribute significantly to the unique character of the Waikato region and its landscape. Beyond the main centres, the Waikato lakes harbour stories, ecological wonders, and historical and cultural significance that are deserving of recognition. This book

unveils the beauty and hidden depths of these waters to provide readers with a deeper understanding appreciation of the intricacies of these fragile ecosystems and the impact of human activities upon them.

Corbicula surveys: Biosecurity New Zealand (BNZ) approached our biosecurity team to design and implement a benthic sled survey programme to help map the extent of invasive gold clam (*Corbicula* species) spread within the Waikato River. This programme uses a small benthic sled towed behind a boat along the riverbed, gathering material from the benthos to see if any clams are present. Our sled design was based on one used by Earth Sciences New Zealand (formerly NIWA) to study clam populations in their known range in the Waikato River. So far, our biosecurity team has surveyed several sites from just downstream of Taupō, down to Lake Whakamaru. Thankfully, no clams have been found there to date.

This work was done in collaboration with local mana whenua, who the team approached for feedback and guidance around sampling in the Waikato River. This ensured proper protocols were followed prior to work commencing, such as karakia, but also to provide the team with valuable knowledge on local wahi tapu sites and areas to avoid. Kaitiaki were present at Lake Ohakuri boat ramp to observe, assist with the mahi and learn about our sampling processes. For any information about this programme please contact Gordon Tieman (gordon.tieman@waikatoregion.govt.nz)



Processing material gathered during a corbicula benthic survey. Photo: Bhakti Patel/WRC.

Macroinvertebrate monitoring: Around 145 sites are sampled between January and the end of March each year as part of our Regional Ecological Monitoring of Streams (REMS) Programme. Some sites (reference and longterm) are sampled annually using Stark methods and we made the switch to NEMS methods for our probabilistic network (random sites) for the first time over the 2023/24 summer period. At each site, ecological habitat assessments are undertaken (e.g. periphyton, substrate, sediment, shade, macrophytes and RHA/QHA) and invertebrate samples collected. We have also begun collecting eDNA samples at reference sites this year. This year's field monitoring team consisted of Nicole Squires and Elizabeth McLean with support from Michael Pingram and the ecology team. For any information about this programme please contact Nicole Squires (Nicole.Squires@waikatoregion.govt.nz).



Alicia Williams (WRC) and Brenda Bartels (Awa Ecology) marvelling over their 1.3m longfin tuna captured from the Waiau River, Coromandel.

Freshwater fish monitoring: The freshwater fish monitoring team monitors around 70 sites between December and April each year as part of our SOE programme. The surveys involve electric fishing or netting paired with an eDNA sample. The freshwater fish monitoring team trialled the Grover-Pro automatic eDNA pump this field season, but encountered performance and reliability issues, so have maintained hand pumped sampling for all sites. This year's field monitoring team consisted of Flavian Ember, Eric Towgood, and Julia McLean, with assistance from the ecology team. For any information about this programme please

Fish Passage monitoring: The newly formed fish passage monitoring programme aims to build on the NIWA/Earth Science NZ Fish Passage Assessment Tool (FPAT) database for structures around the Waikato region. Additional aims include producing internal reporting on the structures that are the highest threat to fish passage, and provide prioritisation for remediation. In the past year, the fish passage team focused on mapping and surveying structures in the Thames-Coromandel District, and completed over 220 field assessments. The fish passage team consisted of Olivia Avery and Rayna Ledbetter, supported by Flavian Ember and Josh Smith. For

any information about this programme please contact Flavian Ember (Flavian.Ember@waikatoregion.govt.nz).

Integrated Catchment Management: Alicia Williams has continued her monitoring of the impacts of new flood pump infrastructure on tuna heke (downstream migrating eels), working with iwi on trap and transfer of tuna and evaluating the impacts of river works on aquatic communities and their habitats. Alicia has also been working on installing instream wood structures for fish, particularly for giant kokopu in sites that have recently undergone desilting. Monitoring of the structures and their performance into creating habitat will be assessed over the summer period.

Pathways to the Sea (PTTS) strategy and monitoring: The PTTS strategy document was finalised in November 2024 with the aim to provide clear direction and guidance for WRC, in terms of improving safe downstream fish passage at our managed pump stations. [Ngā Rerenga ki te Moana | Pathways to the Sea Strategy: Fish passage through pump stations.](#)

This project considered a number of mitigation tools and pump options based on research undertaken to date and has recommended the best options moving forward. Where feasible replacement with a fish friendly pump is ideal, with research to date showing that the encased Archimedes screw pump and the modified MacEwans pump outperform other pumps when it comes to safe fish passage, with 100% survival recorded. Where pump replacement is not feasible trapping upstream migrants and releasing them downstream (trap and transfer) has been shown to

be a cost-effective tool, used to mitigate the effects of pump stations. This mahi would not be possible without our iwi partners and contractors.

Monitoring this season (2025) has concentrated on testing a Bedford 'fish friendly' submersible pump (70.05.12). Due to the high discharge at the site, there were issues with the net rupturing and a small number of tuna being captured for assessment. Repeat monitoring will occur in 2026 to provide clarity on the fish friendliness of the Bedford pump. This work has been a collaborative effort between Alicia Williams (ICM) and Brenda Bartels (Awa Ecology). eDNA samples have also been taken at 21 pumpstation sites that have no fish records to help inform our prioritisation of our pumped catchments, with a further 11 sites to be done over the summer.

A trap and transfer programme was also undertaken this season at seven pumped catchments funded by the Waikato River Iwi Collective and WRC. All catchments are high priority in terms of ecological values and the pumps have documented fish kills. In total about 1.4T of tuna were captured upstream of the pumps and released into the Waikato River, with a single tuna weighing 10kg caught at one of the sites! Taroi Rawiri (Kaahu Taiao Ltd) used customised hinaki, that could be safely deployed and retrieved from the bank, to undertake the work.

For any information about this programme please contact Alicia Williams (Alicia.Williams@waikatoregion.govt.nz).



Custom hinaki set up at Meremere East pumpstation for tuna heke trap and transfer mahi. Photo: Kaahu Taiao Ltd.



Nicole Squires and Travis Moke collect invertebrates at Hamareha Lakes, as part of the Data Deficient Lakes project. Photo: Bhakti Patel/WRC

Data Deficient Lakes: As part of the Data Deficient Lakes Project, the Environmental Monitoring and Biodiversity teams jointly assessed Hamareha Lake and Lake Rotohoko. This comprehensive survey gathered crucial data on water chemistry, fish populations, littoral invertebrates, phytoplankton, marginal vegetation, and bird species.

The survey utilized a range of sampling techniques to measure both physico-chemical and biological parameters. Methods included water quality measurements, fish surveys using traps and eDNA samples, visual and aural bird observations, evaluation of marginal vegetation, and sweep-netting and lake water hauls for invertebrates and phytoplankton.

The findings from this survey will be instrumental in prioritizing restoration efforts, informing biodiversity management strategies, and determining the specific management needs for these lakes.

Publications

Ozkundakci D, Grainger N, Dean-Speirs T. (Editors) 2025. Hidden Gems of the Waikato – The History, Ecology and Management of the Waikato Lakes, O Tatou Roto – He Taonga Tuku Iho.

Taranaki Regional Council

Feature project: Timaru Weir Removal

This project restored fish passage and natural flow to the Timaru Stream. TRC staff led a multi-method fish salvage operation, relocating thousands of native species. AA Contracting and SLR Consulting supported the removal and environmental management.

In February 2025, after years of blocking fish passage, the Timaru Weir on Timaru Stream near Ōakura, Taranaki, was removed in a swift four-day operation led by AA Contracting, supported by SLR Consulting and overseen by TRC staff. The project was supported by the landowners and funded by the Fish Passage Remediation Fund and Fonterra. The weir removal plan was developed in consultation with Ngāti Tairi, Fish & Game and the Department of Conservation.

Before the big break-up, TRC freshwater scientists spent four days relocating aquatic residents from the plunge pool, bypass channel, and the top of the weir. Over 6,000 fish and invertebrates, including longfin eels, redfin bullies and inanga (Table 1), were safely moved further upstream past an exclusion zone. The team used everything from fyke nets to electrofishing to ensure no one was left behind with nets being baited with cat food or vegemite (both hits with the local residents).



Table 1: Number of species relocated upstream before the weir removal

Species	Scientific name	Abundance
Longfin eel	<i>Anguilla dieffenbachii</i>	72
Redfin bully	<i>Gobiomorphus huttoni</i>	3800
Īnanga	<i>Galaxias maculatus</i>	215
Brown trout	<i>Salmo trutta</i>	1
Shrimp	<i>Paratya curvirostris</i>	2000+

As water levels dropped below the upstream intake due to the weir removal, TRC staff stepped in to rescue aquatic life from the bypass channel. This thorough effort ensured safe relocation of native species such as longfin eels, elvers, redfin bullies, lamprey, and koura- over 500 individuals in total. The removal was a success: sediment controls held up well, pH levels stayed within safe bounds, and the river began regrading itself almost immediately. Monitoring will continue over the next year, especially after fresh events. One quirky challenge ahead: preventing fish from re-entering the bypass channel during floods and getting stranded. Solutions are in the works!



Post-removal riffle forming naturally in the streambed

Machinery removing weir



Adult Lamprey trapped in a small pool in the bypass channel



Gisborne District Council

Gisborne District Council's freshwater team have been building the evidence base to support the development of freshwater provisions in the Tairāwhiti Resource Management Plan. The team have focussed on important freshwater issues for our region: water quality, water quantity, gravel management, wetland mapping and identifying locations of freshwater values.

Most of the freshwater technical work has now been completed, with the remaining work expected to be delivered

by mid-2025. The key focus areas for the next six months include progressing work with Expert Panels to provide guidance on research gaps relating to water quantity and water quality, as well as progressing a programme of targeted fieldwork over the coming summer season.

This work will round out the technical evidence base to inform draft freshwater provisions and Section 32 evaluation reports.



Tairāwhiti Resource Management Plan

Maps, schedules and appendices



Greater Wellington Regional Council

GW science team, led by Kerry Charles (Team Leader) is represented by Alton Perrie (Senior Freshwater Scientist), Bram Mulling (Senior Freshwater Scientist), Amanda O'Brian (Senior Freshwater Scientist), and Seamus O'Mahony (Freshwater Scientist). Ashley Alberto (Freshwater Scientist) is on maternity leave and will

be returning in November 2025. GW monitoring team, led by Amanda Valois (Team Leader) is represented by Shyam Morar (Senior Environmental Monitoring Officer), Darien Kissick (Senior Environmental Monitoring Officer), Katie Cook (Senior Environmental Monitoring Officer), Imogen Eglesfield (Environmental Monitoring Officer), and Josh Olsen (Environmental Monitoring Officer).

Finding the Fish: Protecting our threatened species

Greater Wellington environmental scientists Bram Mulling and Shyam Morar are on a mission: to find threatened freshwater fish species in the Wellington Region. They have been revisiting old records, surveying rivers and streams and using environmental DNA to figure out where species such as short jaw kokopu and lamprey might still exist. They've trekked into some remote rivers and in some areas, early eDNA signals have prompted follow-up visits. "We found good signs last year in the Wairarapa region, so we went back recently and actually caught some shortjaw kōkopu," says Shyam. "That was a real high point: to find one of our rarest fish there was the icing on the cake."

DNA provides a snapshot of river populations at a moment in time, so work remains in its early stages. The next step will be selecting a few key sites for long-term monitoring, providing further insight into how populations change over time. The team are also making plans to create a portal for their eDNA results and web-based maps of threatened freshwater fish species in the Wellington region.



Visual Clarity and CDOM

Fine suspended sediment is included as an attribute in the National Objectives Framework (NOF) and councils must set target attribute states for suspended sediment using visual clarity as a surrogate measure of suspended fine sediment. However, brown-water streams contain high concentrations of coloured dissolved organic matter (CDOM) which, in addition to fine sediment, can be a significant controller of light penetration in rivers. GW is investigating the role of CDOM on visual clarity measurements and whether targets should be set below national bottom lines in some rivers which are heavily influenced by CDOM.

Recreational Water Quality (RECWQ) Programme Greater

Wellington's (GW) Recreational Water Quality (RECWQ) Programme monitors water quality to identify public health risks from disease-causing organisms and advise the public of these risks. The programme uses a predictive model which is informed by historical water quality data as well as rainfall for the area to predict swimming risk. Sampling also occurs over the summer to validate the model and update water quality grades. The model is currently being updated by Stantec to reduce the number of false negatives produced by the model. Several new model options that build upon the current system have been recommended and we are currently in the testing phase. Alongside the predictive model, GW is supporting Porirua City Council (PCC) with implementing a real-time enterococcus monitoring system (Proteus probe) in the Onepoto arm of the Porirua Harbour. The Proteus probe is being utilised by PCC to monitor the efficacy of a 7 million litre

wastewater overflow storage facility due to be complete in July 2026. The accuracy and effectiveness of the probe will be assessed at the end of the initial 2-year period.

Torrentfish monitoring in Wairarapa rivers - Torrentfish (*Cheimarrichthys fosteri*) are a native, migratory species that inhabit fast-flowing rivers and are considered an indicator of healthy riverine ecosystems. Monitoring in the Ruamāhanga catchment supports the goals of the Ruamāhanga Whaitua Implementation Programme (WIP), which aims to improve freshwater health through integrated catchment management. This work helps track the effectiveness of actions, such as flow management and habitat restoration by assessing torrentfish presence, abundance, and habitat conditions in key river reaches.

Community Based Monitoring (CBM) GW is continuing to support community based monitoring (CBM) across the motu. We are working with Juliet Milne from Traverse Environmental using funding we received from the A2E programme. We are finalising guidance to support catchment/community groups and coordinators with interpretation of their stream water quality and ecological monitoring data. The guidance will cover the 28 stream health indicators included in the national CBM QA framework, with a particular focus on the 'big 4' contaminants – sediment, nitrogen, phosphorus and E. coli – as well as periphyton and macroinvertebrates. This guidance should be available by the end of 2025.

Canterbury Regional Council

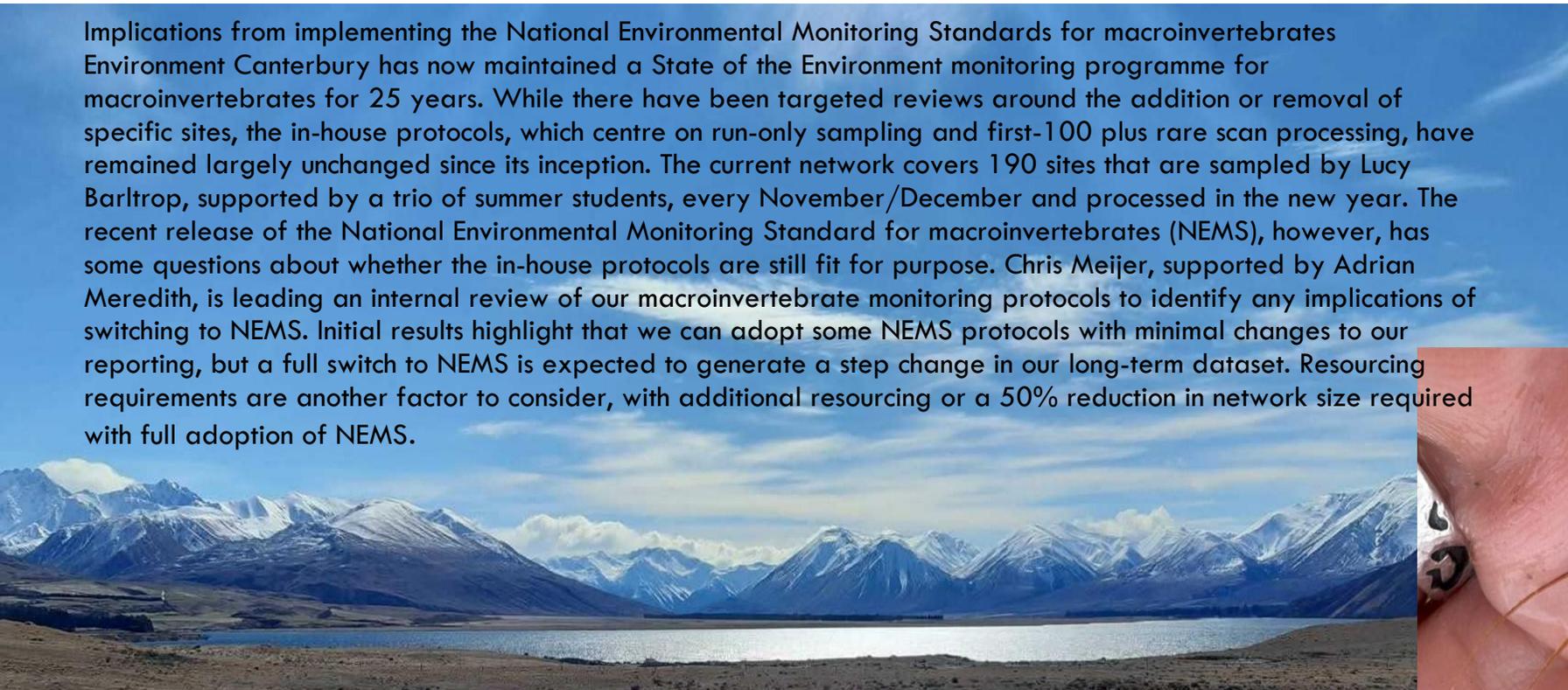
The team continues to do the mahi for our State of the Environment monitoring on water quality and ecology, as well as the seasonal monitoring for contact recreation. These data are reported through LAWA, but some have been used for reporting on the Annual Plan or the Land and Water Regional Plan outcomes. With the support of our data and field teams, we continue to explore potential pathways for improving how we collect, report, and share these data with external partners. Several large, complex consents that have gone or will go to hearings have drawn a considerable proportion of our time this year. Examples include large irrigation schemes, farming land use, gravel extractions, and urban stormwater and wastewater schemes. In addition to these more complex consents, we are also providing advice on several Fast Track applications within Canterbury, including the Tekapo Power Scheme, the Woodend Bypass Project, and various urban developments and solar farms. Last, but not least, we were excited to see the NZFSS executive recognize Adrian's contribution to freshwater knowledge in New Zealand and look forward to his plenary at this year's joint conference right here in Ōtautahi Christchurch.



Feature projects

Implications from implementing the National Environmental Monitoring Standards for macroinvertebrates Environment Canterbury has now maintained a State of the Environment monitoring programme for macroinvertebrates for 25 years. While there have been targeted reviews around the addition or removal of specific sites, the in-house protocols, which centre on run-only sampling and first-100 plus rare scan processing, have remained largely unchanged since its inception. The current network covers 190 sites that are sampled by Lucy Barltrop, supported by a trio of summer students, every November/December and processed in the new year. The recent release of the National Environmental Monitoring Standard for macroinvertebrates (NEMS), however, has some questions about whether the in-house protocols are still fit for purpose. Chris Meijer, supported by Adrian Meredith, is leading an internal review of our macroinvertebrate monitoring protocols to identify any implications of switching to NEMS. Initial results highlight that we can adopt some NEMS protocols with minimal changes to our reporting, but a full switch to NEMS is expected to generate a step change in our long-term dataset. Resourcing requirements are another factor to consider, with additional resourcing or a 50% reduction in network size required with full adoption of NEMS.

Lucy got to see her first ever tadpole shrimp (inset) when we stopped for lunch between monitoring sites near the Ōtūwharekai/Ashburton Lakes. **Photo credits:** Chris Meijer





ECan collects a variety of macroinvertebrate taxa across our monitoring network, including *Psilochorema* caddisfly larvae (top left), *Ameletopsis* mayfly nymphs (bottom left), and *Lancetes* beetle larvae (right). Chris Meijer

Bottom: The lower Rakaia River during the unusually low flows in March 2025. Photo credits: Delia Teesdale



Aquatic Community Ecology and Rare Species Survey (ACERSS)

The Canterbury ACERSS project was set up to study the plants and animals living in selected coastal water bodies along South Canterbury. The survey took place in summer 2024 and covered 15 water bodies between the Ōrari and Waihao catchments. The surveys were undertaken by a large council team, led by **Sriyan Jayasuriya**, with support from external partners including the Department of Conservation and local community groups. We used both eDNA sampling and conventional fish trapping methods to collect data. Most of the water bodies surveyed were lakes or wetlands. River and estuary areas were less common. Many of the sites had disrupted/compromised flow connectiveness, mainly due to human activities like farming, water use, flood control structures, and changes to natural water channels. Most of the coastal water bodies were also cut off from the sea by gravel buildup and stop banks. The eDNA results found 295 different species, grouped into seven categories: simple organisms (like amoebas and sponges), algae, zooplankton, macroinvertebrates (like insects and worms), amphibians, fish, and birds. More than half of the species were macroinvertebrates. Fish made up 7.1% and birds 9.8% of the total. The fish community included 21 species, such as lamprey, eels, four types of galaxiids, four bully species, two triplefins, and two flounder species. Some fish species, like lamprey, giant kōkopu, banded kōkopu, redfin bully, and bluegill bully, were found in fewer than 20% of the sites. A few bird species, such as the Eurasian coot, little black shag, royal spoonbill, and variable oystercatcher, were also seen at only a few locations.

Publications

Bayer, T.; Hayward, S., A. 2025. Upper Waitaki catchment - annual summary of river and lake water quality 2024/25. Environment Canterbury Science Summary Report No. R25/40. [Download link](#)

Measures, R. 2025. Canterbury Hāpua: current state and monitoring needs. NIWA Client Report 2025009CH prepared for Environment Canterbury. [Download link](#)

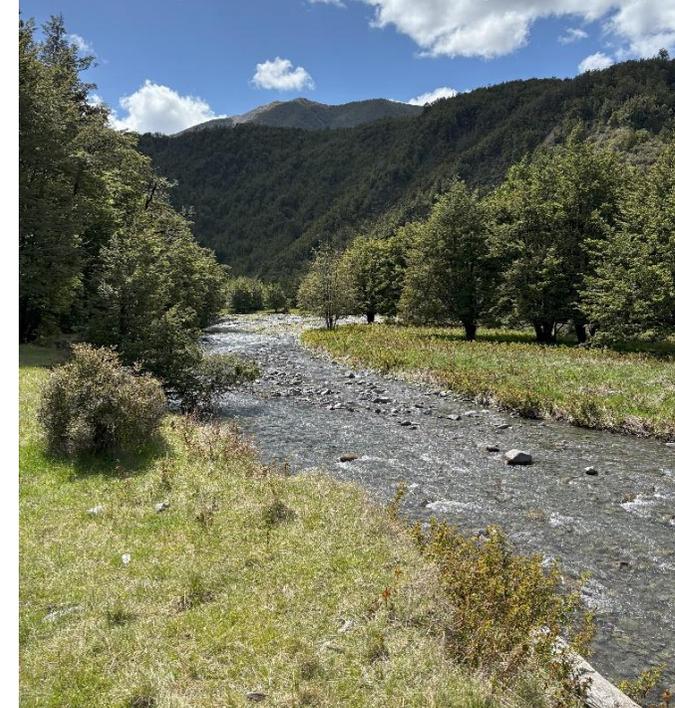
The dedicated team at the Ōrari River Lagoon with support from the Department of Conservation and the local river care group
Photo credits: . Miles Burford, ,



Kayaks were necessary to deploy fyke nets around the larger lagoons during the ACERSS project. **Photo credits:** Delia Teesdale,



Looking upstream of our monitoring site on Andrews Stream near Arthurs Pass. The Environment Canterbury has monitored this site for 25 years **Photo credits:** Lucy Bartrop, ,



Department of Conservation



Department of
Conservation
Te Papa Atawhai

DOC has two teams of freshwater science and technical staff: Freshwater Species (managed by Emily Funnell) and Freshwater Ecosystems and Threats (managed by Nicki Atkinson). This year Nicki has headed back to university for a mini-sabbatical for a couple of semesters, so Rosemary Miller has been acting in her place. Andrew Kirk and Kerry Bodwin have recently left DOC, but we are delighted to welcome Milly Farquhar and Anita Pearson to the technical teams. Milly, previously a Ngā Awa Waipoua Ranger, is now providing technical support to the Ngā Awa programme based in Rotorua. Anita, also previously a Freshwater Ranger, will be bringing her biosecurity technical expertise to the team when she returns from maternity leave. Amber McEwan has joined the team on a short-term temporary contract to provide some much-needed technical support given the current pressure to respond to fast track and other applications. We also have a whole heap of fabulous freshwater rangers sprinkled around the motu that are delivering action on the ground for our freshwater ecosystems and species.

Project name or topic: **Critical Ecosystem Pressures (CRESPP)** research programme

This year after a series of workshops we have published an updated Critical Ecosystem Pressures 4-year research strategy, identifying the most urgent and impactful research needs in the areas of changing water levels/flows, sediment and nutrients, critical habitat loss and fish passage. You can find it here: <https://www.doc.govt.nz/globalassets/documents/conservation/land-and-freshwater/freshwater/cresp-research-strategy.pdf>

CRESPP is a very externally-facing programme, and we are currently doing research in partnership with a wide range of organisations, including rūnanga, universities, councils, CRIs, and government departments. At present we have two MSc projects, four PhD projects and three partnership projects with external agencies, in addition to several internal projects.

A number of students funded through this program have finished recently, and we have been producing research project summaries of key results to share publicly. We want to streamline new knowledge for immediate use in conservation management and advocacy. You can find these on the CRESPP webpage under 'research project summaries.' <https://www.doc.govt.nz/our-work/critical-ecosystem-pressures-on-freshwater-environments/>

We have also been working on developing a series of habitat description reports for non-diadromous galaxias to provide support for advocacy processes. This year we produced reports describing the habitats of southern flathead galaxias, Teviot flathead galaxias, Nevis galaxias, alpine galaxias (Southland) and alpine galaxias (Manuherikia River). You can find them all under 'Reports' on the CRESPP webpage:

CRESPP continues to be led by Nixie Boddy, with support from Sjaan Bowie, Nicholas Dunn, Phoenix Hale, Chris Woolmore and Craig Woodward.

Outputs:

Boddy, N. (2024) Critical Ecosystem Pressures on Freshwater Environments (CRESP) 4-year research strategy. Department of Conservation, Wellington, New Zealand. 10p.

Dunn, N.R.; Boddy, N.C. 2024: Galaxias “southern” (southern flathead galaxias) habitat description. Unpublished report DOC - 7782279. Department of Conservation, Wellington, New Zealand. 6 p.

Dunn, N.R.; Boddy, N.C. 2024: Galaxias “Teviot” (Teviot flathead galaxias) habitat description. Unpublished report DOC-7707164. Department of Conservation, Wellington, New Zealand. 6 p.

Dunn, N.R.; Boddy, N.C. 2024: Galaxias “Nevis” (Nevis galaxias) habitat description. Unpublished report DOC-7707169. Department of Conservation, Wellington, New Zealand. 6 p.

Dunn, N.R.; Boddy, N.C. 2024: Galaxias affinis paucispondylus “Southland” (Southland alpine galaxias) habitat description. Unpublished report DOC-7709842. Department of Conservation, Wellington, New Zealand. 6 p.

Dunn, N.R.; Boddy, N.C. 2024: Galaxias affinis paucispondylus “Manuherikia” (Alpine galaxias (Manuherikia River)) habitat description. Unpublished report DOC-7708624. Department of Conservation, Wellington, New Zealand. 6 p.

Hore et al. (2025) Flow matters: unravelling the interactive influences of flow variation and non-native trout on vulnerable galaxiids. *River Research and Applications*, **0**, 1-12

Freshwater biosecurity: research and development programme

Ngā Riha wai-Māori | Freshwater Pest Species focusses on research and development, and management of key freshwater pest species. This year, following multiple workshops with key stakeholders, we have produced a programme strategy (see:

<https://www.doc.govt.nz/globalassets/documents/conservation/land-and-freshwater/freshwater/nga-riha-wai-maori/nga-riha-wai-maori-national-strategy.pdf>) that sets



An educational dissection of a female koi carp, demonstrating a fistful of roe (fish eggs). **Photo credits:** Nigel Binks

five main objectives for DOC when working in the freshwater biosecurity system; effective and efficient operational delivery, advanced capability and capacity, cohesive interagency

collaboration, strong relationships with tāngata whenua and communities, and development of research and tools.

While Ngā Riha wai-Māori conducts and invests in various different research projects to improve the toolbox with which to manage freshwater pests, there is a core focus on the surveillance, control, and eradication of species already established in the country, such as koi carp (*Cyprinus rubrofuscus*). In the Lower North Island (the DOC region that encompasses Greater Wellington, the Manawatū, and Hawke’s Bay), there has been concerted effort to eradicate three of the four known populations of koi carp in the hopes of slowly reducing their extent across the North Island back to the

Containment Area that includes Auckland and parts of Waikato.

In order to achieve these eradications, the team has employed various different methods from a cube root slurry (rotenone) application in a private dam near Dannevirke, a drawdown operation in private storm retention ponds in Paraparaumu, and drainage and manual removal of private pond in Rongotea. While the Paraparaumu operation was postponed to the early 2026 due to high rain fall, the other two operations appear to be successful and will be monitored over the next three years to determine successful eradication.

Outputs:

Özkundakci, D.; Burdon F. J.; Woelmer, W. M. 2025. Recommendations to rehabilitate freshwater habitat in Lake Waahi for native species. Unpublished Report DOC-10418709. Department of Conservation, Hamilton, New Zealand

Hicks, B. J., Archer, M., Binks, N. A., Macdonald, A., Cox, D., Rossaak, A. 2025. Waikato Koi Carp Management: Technical Review. Morphum Environmental. Unpublished Report DOC-10418760. Department of Conservation, Hamilton, New Zealand

Reiser, A., Burdon. F. J. 2025. EDNA detection methodology for koi carp in lentic waterbodies.

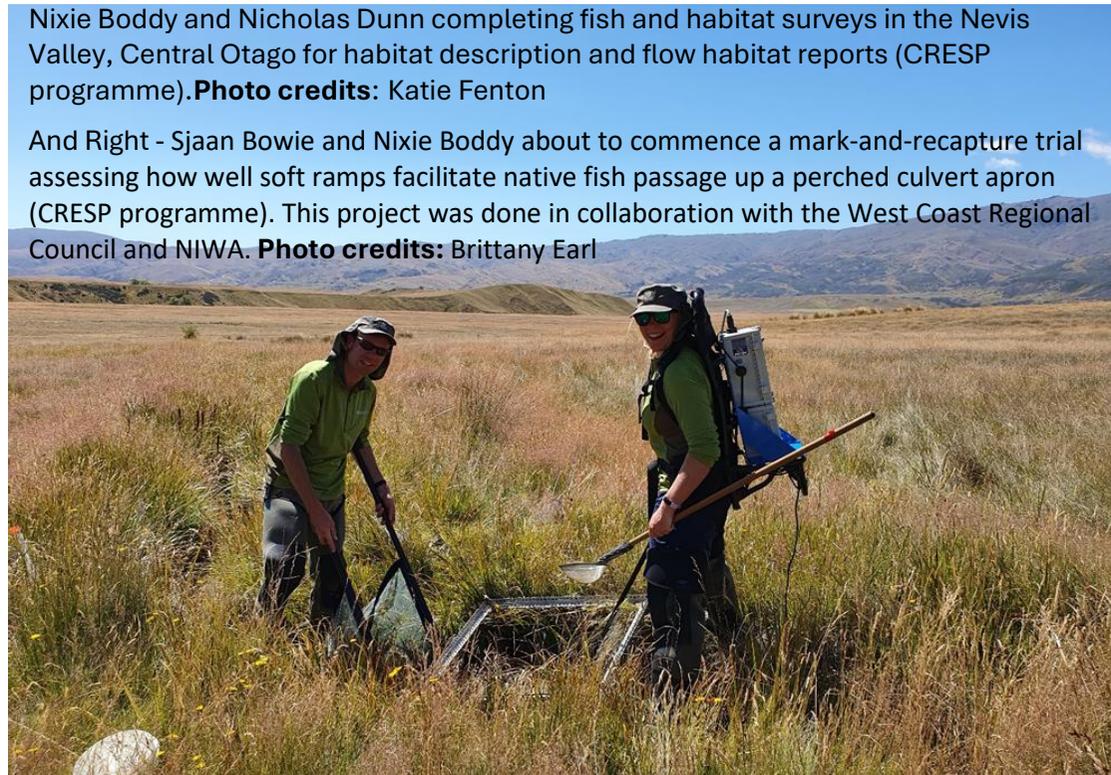
Unpublished methodology DOC-10418751 and flowchart DOC-10418878. Department of Conservation, Wellington, New Zealand

Miller, E., Smith, D. (2024). Koi carp passage assessment of the Mangaotama catchment in Ohaupo. Unpublished Summary Report DOC-10418729. Department of Conservation, Wellington, New Zealand.

Reiser, A.; Burdon, F.J.; Bodmin, K; Binks N.B. 2025. Detecting low densities of koi carp and other pest fish species in lakes using environmental DNA. An MSc (Research) Thesis DOC-10418894. University of Waikato.

Nixie Boddy and Nicholas Dunn completing fish and habitat surveys in the Nevis Valley, Central Otago for habitat description and flow habitat reports (CRESP programme). **Photo credits:** Katie Fenton

And Right - Sjaan Bowie and Nixie Boddy about to commence a mark-and-recapture trial assessing how well soft ramps facilitate native fish passage up a perched culvert apron (CRESP programme). This project was done in collaboration with the West Coast Regional Council and NIWA. **Photo credits:** Brittany Earl



Ngā Ika e Heke/Freshwater Migratory Fish Programme

Description: Ngā ike e Heke/Freshwater Migratory Fish focuses on securing populations of four indigenous migratory fish species across Aotearoa; inanga and longfin eel (at risk and declining), shortjaw kokopu and piharau/lamprey (threatened nationally vulnerable). These species were selected due to trends in their population status and in recognition of taonga status in Treaty settlements.

This year's focus has been on building iwi/hapū relationships and improving knowledge of the distribution and status of two rarer species, shortjaw kokopu and lamprey. This information will help inform future management of the species. In our fourth year of shortjaw kōkopu survey work, we have completed more than 300 surveys nationwide. Lamprey pheromone sampler surveys have been carried out in close collaboration with mana whenua and Cindy Baker (NIWA). The data from these surveys is being used to determine where the key spawning tributaries are across several catchments. In the regions where we have a good knowledge of species distribution and status, we are moving into the next phase of the programme. This includes co-designing management plans with mana whenua and implementing actions to secure the species. Female lamprey caught in a cascade at McKay Creek on the Westcoast of the South Island. **Photo credit:** Susan Harris



Information on the spawning biology of shortjaw kokopu, is a critical need for informing management actions. Shortjaw spawning surveys were carried out at several sites again this year. This information will help us to understand the timing, location and triggers for spawning events. Trail cameras in Northland have revealed that rats are a common predator of shortjaw kokopu nests. To protect nests,

rodent control was extended to include a further spawning site in Northland.

Outputs:

Richarson, M. R. A., & Ingram, T. (2025). Effects of competition and predation risk from a life history intraguild predator on individual specialisation. *Journal of Animal Ecology*, 00, 1–12. <https://doi.org/10.1111/1365-2656.70090>

Fish Passage

Over the past year, Fish Passage work has focused on advising and supporting improved management of instream structures at priority sites, updating key guidance, and promoting best practices. Exclusion barrier efforts have continued, including a new installation in the Waitaki River to protect bignose and lowland longjaw galaxias.

We've developed a tool using the Fish Passage Assessment Tool and key freshwater data that categorises and prioritises instream structures for improved fish passage management. Of over 150,000 structures identified nationwide, around 30 on PCL have fish passage improvements, over 50 are being considered for better management or have had passage improved, and several thousand have been flagged for maintenance to protect native fish refuges

We worked with NIWA and others to update the National Fish Passage Guidelines and develop a new technical monitoring manual. DOC's Fish Passage webpages were also refreshed to reflect and link to this updated guidance. Sjaan Bowie and Eugene Vodjansky (BBO) delivered webinars to key audiences outlining the changes.

The NZ Fish Passage Advisory Group (NZFPAG), active since 2014, has now closed, with a new Fish Passage Management Group being formed under SWIM, with DOC continuing its involvement. Over the past decade, NZFPAG made significant contributions to fish passage

management, including developing national guidelines, tools like the Fish Passage Assessment Tool, and supporting new requirements under the NPS-FM and NES-F. It also produced widely used resources and helped drive national research and action. We thank all members for their dedication and ongoing support for fish passage in Aotearoa.

We've continued to test the effectiveness of baffles and ramps at several West Coast culverts and are now documenting insights from their installation, maintenance, and performance.

Outputs

Baker, C., Franklin, P., Williams, P. 2024: Guidelines for monitoring fish passage success at instream structures and fishways. Prepared for the Ministry for Environment. 2024156HN. 123p. DOC-7728286

Department of Conservation, 2025: Rites of Passage. Article for NZ Water Review. Rites of fish passage - New Zealand Water Review

Franklin, P. Baker, C., Gee, E., Bowie, S. C., Melchior, M., Egan, E., Aghazadegan, L., Vodjansky, E. 2024: New Zealand Fish Passage Guidelines. Version 2.0. Prepared for Ministry for Environment. P 427. DOC-7466823

Jolly, M. E., Warburton, H.J., Bowie, S. C., Challies, E., Jellyman, P.G., McIntosh, A.R. 2024: Isolation management to protect threatened native galaxiid fish species: Lessons from Aotearoa New Zealand. Aquatic Conservation:

Marine and Freshwater Ecosystems. 24;7. <https://doi.org/10.1002/aqc.4220>

Jolly, M.E., Warburton, H.J., Bowie, S. and McIntosh, A.R. (2025), Managing Isolation: Implementing In-Stream Barriers to Exclude Introduced Trout From Fragmented Native Freshwater Fish Refuges. River Res Applic. <https://doi.org/10.1002/rra.4447>

Whitebait Fishery

The Department of Conservation manages the whitebait fishery under the Whitebait Fishing Regulations 2021. This year's ongoing focus has been building whitebaiter awareness and understanding of the regulations and our knowledge of the historic whitebait catch quantities and distributions through whitebaiter catch diary analysis. This is to inform future decision making and management of the whitebait species.

Outputs

Watson, A., West, D., Ough Dealy, H., Comrie, J. 2025: Whitebait season information capture, 2022. Department of Conservation. 978-1-0670773-2-7 (web PDF)



Threatened fishes

The Freshwater Species Team continues to work on improving the understanding of threatened freshwater fishes fundamental ecology, population status, trend, and distribution, and habitat requirements to underpin conservation prioritisation and management decisions. Highlights from this work over the last year include progressing development of a data management, analysis and reporting system to inform conservation status assessments, conservation management prioritisation, and identification of known habitats of freshwater fishes; and assisting in regional threat assessments with Regional Councils. Nicholas Dunn continues his work on taxonomic descriptions of non-diadromous Galaxias taxa. Daniel Jack is investigating translocation options for the Teviot flathead galaxias in the Lake Onslow area. Preliminary results suggest several waterways show promising potential. Daniel also continues a programme of work revisiting historic NZFFD records of unverified non-diadromous galaxias species observations and potentially erroneous identifications, with samples processed by the conservation genetics team from the Zoology Department at the University of Otago. There have been clarification of species distribution between areas of contact between Gollum galaxias, Clutha flathead galaxias and Pomahaka galaxias in waterways of the north

Catlins Region, and the Mataura River and Clutha Mata Au River catchment boundaries.

Freshwater Invertebrates NZTCS Threat Classification Review process

The NZTCS review for freshwater invertebrates is being divided in two parts. The first part will see the review of EPT fauna and will commence in July 2026. This will then be followed by the remaining taxa review during the following financial year. This process is being led by Technical Advisor Nigel Binks.

Any new population trend and distribution data pertaining to EPT taxa with Data Deficient or Threatened status can be forwarded to DOC's Technical Advisor Lead, Nigel Binks, for consideration. Nbinks@doc.govt.nz



Department of
Conservation
Te Papa Atawhai

Susan Emmitt holding one of the largest koi caught in the removal operation near Dannevirke (Ngā Riha wai-Māori | Freshwater Pest Species programme). **Photo credits:**



Organisation updates
Environmental Consultancies



SLR Consulting NZ Ltd have expanded over the last couple of years and now have offices throughout the North and South Islands, with freshwater scientists based in Whangarei, Auckland, Tauranga, Gisborne, New Plymouth, Wellington, Nelson and Dunedin. Freshwater taxonomic laboratories are established in Nelson and Dunedin where we have experienced teams working within dedicated sample processing facilities.

Left: Celine Dufour collecting macroinvertebrates in the Wairoa River and Right: Processing macroinvertebrate samples in the Nelson laboratory



Among the many exciting and interesting projects undertaken this year was an ecological survey of Lake Matiri within view of the beautiful Thousand Acres Plateau landscape, near Murchison, Tasman. Divers from SLR undertook macrophyte and kākahi (freshwater mussel) surveys of the lake and set fyke nets and minnow traps throughout the lake for next day retrieval. Longfin (*Anguilla dieffenbachii*) and shortfin (*Anguilla australis*) eels were captured as well as Kaharore bullies (*Gobiomorphus mataraerore*). A composite eDNA sample was also taken from the lake and whilst kōaro (*Galaxias brevipinnis*) were

detected, they likely reside in the mountain streams that flow into the lake.



Macroinvertebrate microscopy photographs

SLR Dunedin laboratory has been involved with processing elver and whitebait samples retrieved from Manawa's fish trap at their Patea Hydroelectric Power Scheme (HEPS). Elver processing is completed alongside work with Earth Sciences NZ where processed elver samples from our laboratory are sent to Earth Sciences NZ for otolith analysis and inclusion in the nationwide research programme. The team also undertook stream ecology surveys and eel bypass assessments upstream and downstream of the HEPS.

Lake Matiri, near the Thousand Acre Plateau



SLR Gisborne and Tauranga ecologists have been involved in the Transport Rebuild East Coast alliance, which looks to rebuild parts of State Highway 35 through the Mangahauini Gorge north of Gisborne, after Cyclone Gabrielle caused major damage in February 2023. A lot of the works is in and around the Mangahauini River, where the riverbed was shifted, eroding the land beneath the state highway. Half a kilometre of the riverbed will be reshaped and a 'roughened channel'

constructed from interlocking blocks (called hanbars), rocks and other material, the first of its kind in a New Zealand river.

SLR divers, Robyn Dunmore and Reid Forrest, with Ultimate Descent's raft guide at the helm at Lake Matiri.



Our team of nine has been very stable, with no staff leaving or joining in the past 12 months. We have Lucian Funnell in Dunedin, Tessa Roberts and Lily Tidwell in Wellington, Meredith Davis in Tauranga, Richard Storey, Brent Henry and Josh Thoresen in Auckland, Stephen Brown in Whāngarei and Olly Ball in Kerikeri. The team has been involved with a wide range of projects from community-based monitoring to restoration plans and advice for policy development.

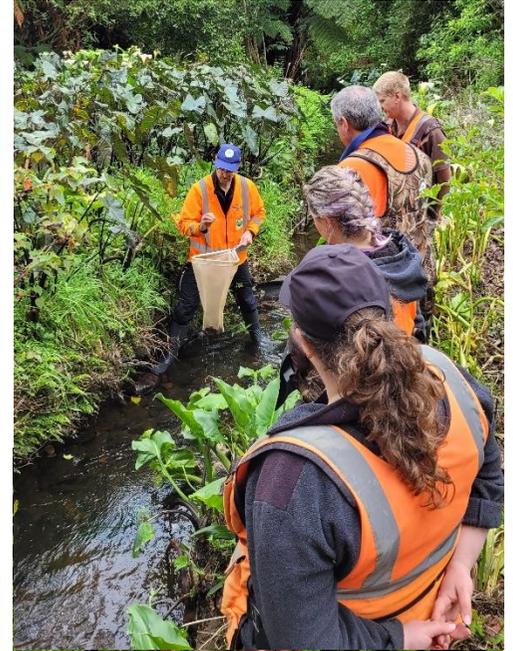
Feature projects:

Monitoring: the Wildlands team have continued regular invertebrate monitoring for forestry companies in Gisborne, and for water takes and waste water treatment plants in the far north. They've also continued fish monitoring of the streams around water supply dams in the Hunua and Waitakere Ranges [Brent Henry, Josh Thoresen, Olly Ball, Stephen Brown, Richard Storey].

Top right-Richard Storey training staff from NZ Environmental Management to use the SEV Photo credit: Ashlee Deeming, NZEM.

Left - Tessa Roberts holding an eel rescued from the Kenakena (Te Atiawa) Stream, Paraparaumu, before the giant FishFlow pump is installed. Photo credit: Kāpiti Coast District Council

Bottom right - A big catch during monitoring of water supply catchments in the Hunua Ranges." Photo credit: Wildlands



Stream Ecological Valuation: Wildlands' expertise in the SEV has been put to good use this year, as we've done a number of SEVs for large subdivisions and infrastructure developments, reviewed other consultants' use of SEV in resource consent applications, and have trained consultants in using the method [Tessa Roberts, Lily Tidwell, Richard Storey].

Citizen science: Richard Storey revived his interest in community-based monitoring this year, helping the Te Ararata Stream Team in Māngere (Auckland) to develop a monitoring plan for their awa, with assistance from MfE's Access2Experts programme. Meanwhile, Meredith Davis has continued to assist various iwi/hapū (one project via Access2Experts), community groups and schools to monitor and restore important streams and wetlands in the Bay of Plenty.

Fish Passage and fish management: Wildlands have worked with engineers to design creative fish passage solutions in some challenging and unusual situations, e.g. in steep catchments and at a pump station in Kāpiti where water flow directions were counter-intuitive (for fish). Staff have also been involved with fish management and salvage in subdivisions, public walkways and state highways in Wellington, Hawke's Bay and Auckland [Tessa Roberts, Lily Tidwell, Josh Thoresen, Meredith Davis, Richard Storey].



Lily at Fish Barrier: See Lily Tidwell, practicing their 'construction site lean' and testing the strength of the fish isolation net in a tributary of the Pauatahanui Stream". Photo credit: Tessa Roberts

Advice for policy and decision-making: Wildlands have provided advice to EPA expert consenting panels on several fast-track applications in the past year. The team has also provided input to Auckland Council's upcoming policy on riparian management for intermittent streams, and to several iwi and hapū in Bay of Plenty on adapting their freshwater policy in light of the recent changes to the RMA and NPS-FM. [Richard Storey, Meredith Davis].

SoE reporting: Wildlands provided data analysis and co-authored the "River Ecology State and Trends in Tāmaki Makaurau/Auckland 2024" report for Auckland Council. [Richard Storey].

River and catchment restoration: Wildlands ecologists are developing nine river restoration plans for Gisborne District Council, and recommendations for building on the successes of the Piako Green Corridor for Waikato Regional Council. [Meredith Davis, Richard Storey].

Publications:

Marsh, H., Storey, R., Kusabs, I., & Smith, B. (2024). Adaption of a traditional Māori fishing method for biomonitoring: using whakaweku for sampling benthic macroinvertebrates in streams. *New Zealand Journal of Marine and Freshwater Research*, 1-18.

NZFSS, NZ Ecological Society, and Water NZ Stormwater. We are also looking forward to reconnecting at the

upcoming NZFSS conference in Ōtautahi Christchurch, where **Duncan Law** has played an important role on the organising committee.

Beyond the conference circuit, our people remain actively involved in professional groups such as the Rivers Group, CEnvP, EIANZ, NZES and NZFSS. We continue to upskill our people through courses like SEV and EFM Operators and internally through our Centres of Technical Excellence.

New Staff: The 2024/25 year has brought several changes to the Tonkin + Taylor Ecology & Water Science Group, which boasts a team of 44 passionate specialists! We have welcomed new team members, celebrated returns from parental leave, and farewelled several freshwater ecologists as they embark on overseas experiences or further academic pursuits. We wish them all the best and hope to see them back at T+T soon. We've also had several team members head off on parental leave - congratulations to them and their growing whānau! We are thrilled to share new permanent additions to our freshwater ecology team: **Ruby Leeves** and **Tyler Eaton-Palmer** (Auckland),

Angela Smith (New Plymouth), and **Pippa McAnergney** (Wellington). Ruby and Pippa were previously interns with the team and it is great to have them fully on board now after completing their studies.

Shamyi Lanjouw during EFM surveys – credit **Danielle Cairns**

Organisation update

We have seen continued momentum in the freshwater space over the last 12 months, with our team contributing to a diverse range of projects across the transport, energy, water, land, waste, and extractive industry sectors. Our work has included a mix of straight forward and complex ecological impact assessments covering stream, river, wetland and lake environments, related offset and compensation assessments and ecological management plan development. Our compliance monitoring work in the stormwater, water supply and hydro-electricity space has also been ongoing. Our freshwater, marine, and terrestrial specialists are working closely together to deliver holistic, te mana o te wai-aligned advice that reflects ki uta ki tai thinking.

Our team has made the most of opportunities to connect kanohi ki te kanohi with clients and peers at events across the motu. Over the past year, we have attended conferences including



Tonkin and Taylor Feature projects

Hamilton City Integrated Catchment Management Plans

Our Hamilton Ecology + Water Science team has been supporting Hamilton City Council with technical studies to inform stormwater focused ICMPs for some larger city catchments. The ICMPs offer an opportunity to deep dive into the issues facing a particular catchment's receiving environments, which can include water and sediment quality, fish passage, ecological health and habitat quality. This leads to stormwater management options and solution development including receiving environment restoration programmes in collaboration with council and other stakeholders. Key staff involved include **Steve Pratt, Dean Miller, Tumanako Ritchie, Paul Dyer** and **Bryn Quilter**.



Waterfall feature during instream surveys – credit Danielle Cairns

Te Ara o Te Ata – Mt Messenger Bypass

The Te Ara o Te Ata - Mt Messenger Bypass project has had another successful year with the 2024-2025 construction season. In 2024, **Angela Smith** stepped into the role of Ecology Team Lead and has been diving into the diverse and fascinating ecology work streams. **Sarah Hart** has been at the forefront of biosecurity on-site and expertly managing the wetland monitoring program with guidance from **Fiona Macintosh**. Meanwhile, **Chloe Samaratunga** and **Sam Mulcock** have been busy mapping the streams and wetlands across the project and compiling geospatial data into interactive GIS Dashboard tools. **Mike Lake** has continued his role as Freshwater Technical Lead, overseeing all aspects of freshwater ecology, including fish passage, stream diversion design, construction monitoring, and fish recovery and relocation. Other ecological workstreams, including bats, lizard, peripatus and kiwi are being looked after by **Jamie McKay** as the Terrestrial Technical Lead.



Tongariro River – credit Paul Dyer

Transport Sector

Our wider Ecology + Water Science team continues to make strong contributions to the transport sector across the motu. Our involvements span compliance monitoring, consenting, investment cases, and support during the construction phases of several major roading developments.

On the ground, our team has been actively engaged in tasks such as stream classification and ecological valuation, stream diversions, wetland delineations, monitoring and fish salvage operations.

Key projects that the team are involved in are Ōtaki to North Levin, Woodend Bypass, Pūhoi to Warkworth, Te Ara o Te Ata (Mount Messenger Bypass), and Ō Mahurangi (Penlink).

In June, we celebrated the official opening of Te Ahu a Turanga – Manawatū Tararua Highway, where our team played a pivotal role during the design, resource consent, and early construction phases. Special recognition goes to **Duncan Law** and **David Pickett** for their contributions to the project.

While nearly all members of our freshwater team have contributed to transport projects, we'd like to give special mentions to **Duncan Law, Patrick Lees, Mike Lake, Angela Smith, Justine Quinn, Liza Kabrle,** and **Danielle Cairns**.

Turitea Windfarm – Palmerston North

The Turitea Windfarm is owned by Mercury NZ Ltd. and is currently New Zealand's largest windfarm comprising a total of 60 turbines with an annual output of 840 GWH following commissioning in May 2023. The T+T Ecology team have been involved in the Turitea Windfarm project for a total of eight years. In this time the team have supported the project through development of management plans and collection of baseline information preconstruction, through to construction phase monitoring and adaptive management, and more recently through the progressive completion of post construction monitoring. Throughout the project the team have had the chance to work in what is both a picturesque and physically challenging setting of the Tararua Ranges and specifically the beautiful Turitea Reserve. All required aquatic monitoring will be completed by the end of 2025. This will bring to a close a great project for the T+T team to have been a part of, and a project representing a notable contribution to New Zealand's renewables portfolio. Big thanks to all those involved **Kate Rogers, Claire Bullock, Toni Shell, Dean Miller, and Steve Pratt.**



Paul Dyer conducting periphyton assessments – credit Tumanako Ritchie



Torrentfish caught during EFM surveys – credit Danielle Cairns

Publications:

Mike Lake was excited to see the release *Hidden Gems of the Waikato – The History, Ecology and Management of the Waikato Lakes* which includes a chapter on freshwater fish that he contributed to.



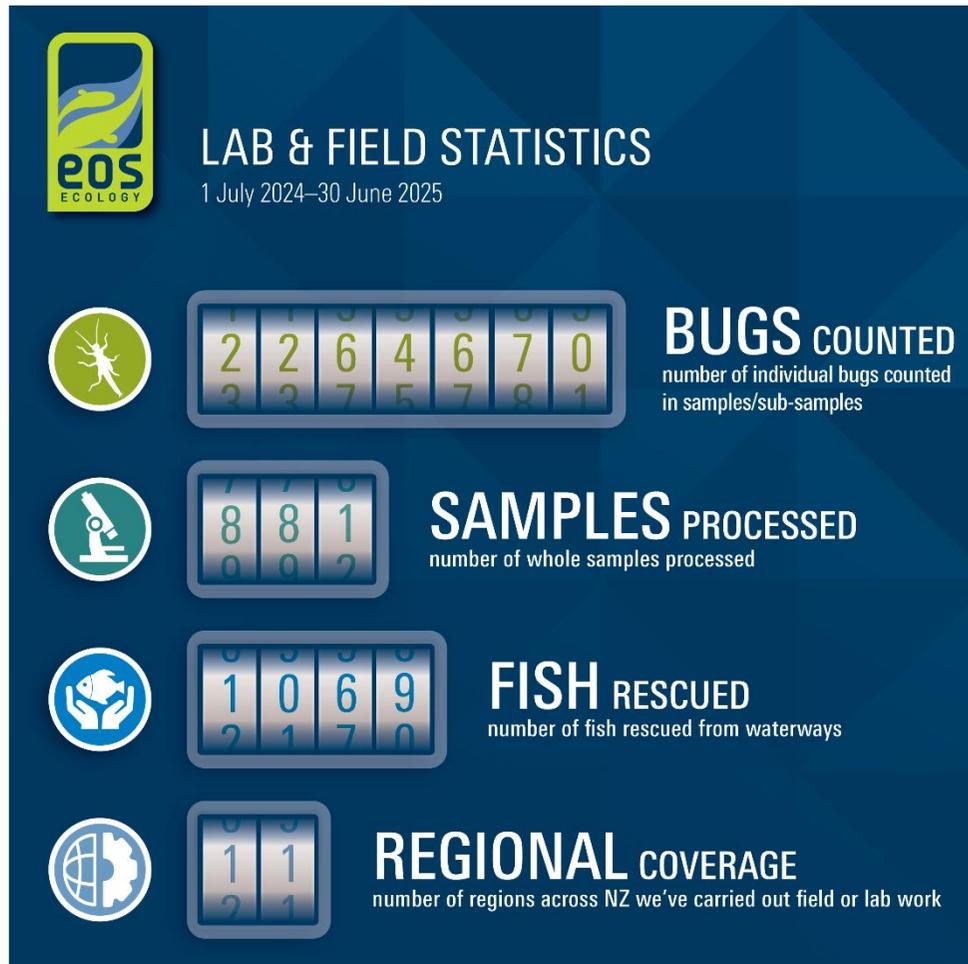
EOS Ecology

It's been another busy year here at EOS Ecology. We continue to provide science, GIS, science interpretation & design, and engagement services to a diverse range of end users across the country. Our work over the last year has seen us continue to focus on national level projects, by providing technical support to organisations helping catchment groups across Aotearoa. We're using GIS and FME to develop and implement a nationwide process for presenting modelled and sampled catchment health data for catchment/community groups. [AP1] We've also been active with more localised projects across both the North and South Islands.

Our Field and Laboratory team have been busy with ecological surveys, fish rescues, and processing macroinvertebrate samples collected from around Aotearoa. Our Engagement team continues to support catchment groups and schools across the Waitaha/Canterbury region to better understand their local awa/catchment, and our Science team has been developing catchment management plans, tools, and solutions for improving waterway health.

Across all disciplines, our Science Interpretation & Graphic Design team ensure our outputs are appropriate for the end user, engaging, and well received. There is growing awareness among scientists and organisations about the importance of producing content and outputs that are accessible and appealing to a wider audience. The services our team provides address this need by translating complex scientific information into plain English, presented in a visually compelling format.

See photo on the right: Just a few statistics from the hard-working EOS Ecology Field and Lab team. **Photo credit: EOS Ecology**



EOS Ecology Feature Projects

‘Wai Connection’ – National Technical Support & Regional delivery in Waitaha/Canterbury

EOS Ecology continued to wear two hats as part of the ‘Wai Connection’ project during 2024-2025.

Firstly, we worked alongside the Mountains to Sea Conservation Trust (MTSCT) National Project Support Team (including, but not limited to, Kim Jones, Holly Cole, Nicholas Naysmith, and Patricia Clark) to roll-out Year Two of the *Essential Freshwater*-funded ‘Wai Connection – Tatai Ki Te Wai’ project – a catchment group support and engagement project operating across Aotearoa New Zealand. As the ‘Wai Connection’ National Technical Support Team providers, our scientists (including, but not limited to, Shelley McMurtrie, Zoë Dewson, Alex James, Catherine Grima, Jesse Burns, Jon Bray, Emily Goldfinch, Annabel Barnden, Ariana Painter), GIS specialists (Kyle Dow, Chris Wilson, Marcus Rodger, Baily Lelieveld) and science interpreters and graphic designers (Bronwyn Gay, Rochelle Pithie, Melissa Gray) helped support regional Provider Organisations (POs) in nine regions across Aotearoa, as well as supporting the MTSCT National Project Support Team. Our National team provided key resources and specialist skills to POs, so they were

better able to get out there alongside their catchment groups to effect positive change. One of our key deliverables was the development of 52 Focus Catchment Map Series (FCMS) publications for the POs and their catchment groups, and engaging with 118 groups, POs, councils, and other organisations in our delivery of online and in-person FCMS science workshops (see more in the FCMS article). Other key outputs included science guides for how to use the ANZECC DGVs; how to interpret visual clarity data using the NPS-FM trigger values; training of POs using community-based monitoring methods; science posters about catchment function, the nitrogen cycle, springs, lake trophic level index, and urban stormwater networks; fish posters for each region based on analysis of fish data from the NZFFD and publicly available Wilderlab eDNA records; catchment group stories for each region; posters and banners for the project; and supporting the development of an Investment Ready Business Case to further the vision for a Community-based Freshwater Monitoring (CBFM) website and data portal.

Secondly, as the Regional Delivery team for ‘Wai Connection’ in Waitaha/Canterbury, our Engagement team (Jessica Halsey, Courtney Bosse, Helena Quilter, Briar Inwood) and our Science team (Emily Goldfinch, Nick Hempston, Ariana Painter, Annabel Barnden, Oly Hall, Brooklyn Lea, Jesse Burns, Shelley McMurtrie) worked alongside 69 catchment groups, providing hands-on science support tailored to local needs. This included training community members in community-based monitoring methods, helping groups design scientifically robust monitoring programmes, guiding them in data collection and interpretation, creating community-based monitoring reports to help them communicate their results, and running science workshops to take them through their known catchment data. The skills of our Science Interpretation & Graphic Design team meant the outputs we provided were designed and presented in such a way that made them of real use and relevance to groups. By embedding scientific support directly into community-led initiatives, we’re helping ensure that local monitoring not only meets national quality standards but also drives practical change

for our waterways. Our team has also facilitated cross-group learning, connecting smaller rural catchment groups with larger collectives so that knowledge, methods, and resources were shared, and running local event and regional hui to bring community together. We've also worked closely with Environment Canterbury, NZ Landcare Trust,

MPI, and other regional partners to ensure our efforts are aligned rather than duplicated, and to strengthen outputs and build trust between communities and agencies.

Outputs:

Our catchment group resources can be found at

<https://www.waiconnection.nz/pages/resources>

· Catchment group stories and FCMS outputs can be found at

<https://www.waiconnection.nz/pages/focus-catchment-resources>

Publications

See those listed on

<https://www.waiconnection.nz/pages/focus-catchment-resources>

EOS Ecology 2025. Ahuriri Tributaries Focus Catchment Map Series – January 2025. EOS Ecology, Christchurch. 91 p.

EOS Ecology 2024. Akaroa Harbour Focus Catchment Map Series – August 2024. EOS Ecology, Christchurch. 87 p.

EOS Ecology 2024. Arapārerā Focus Catchment Map Series – December 2024. EOS Ecology, Christchurch. 71 p.

EOS Ecology 2025. Bream Bay Focus Catchment Map Series – May 2025. EOS Ecology, Christchurch. 89 p.

EOS Ecology 2025. Upper Ruamāhanga Focus Catchment Map Series – May 2025. EOS Ecology, Christchurch. 99 p.

EOS Ecology 2024. Ewelme to Kōwhai River Focus Catchment Map Series – April 2025. EOS Ecology, Christchurch. 91 p.

EOS Ecology 2024. Hakataramea Focus Catchment Map Series – October 2024. EOS Ecology, Christchurch. 87 p.

EOS Ecology 2024. Herekino Harbour Focus Catchment Map Series – October 2024. EOS Ecology, Christchurch. 73 p.

EOS Ecology 2024. Hokianga Harbour North Focus Catchment Map Series – October 2024. EOS Ecology, Christchurch. 89 p.

EOS Ecology 2024. Jed River Focus Catchment Map Series – September 2024. EOS Ecology, Christchurch. 85 p.

EOS Ecology 2024. Kaikōura Flats Focus Catchment Map Series – November 2024. EOS Ecology, Christchurch. 87 p.

EOS Ecology 2025. Kaipara Harbour South Focus Catchment Map Series – May 2025. EOS Ecology, Christchurch. 91 p.

EOS Ecology 2025. Kaiteriteri/Mārahau Coast Focus Catchment Map Series – May 2025. EOS Ecology, Christchurch. 73 p.

EOS Ecology 2025. Koukourārata/Port Levy & Eastern Bays Focus Catchment Map Series – May 2025. EOS Ecology, Christchurch. 79 p.

EOS Ecology 2025. Lake Benmore - Ahuriri Arm Focus Catchment Map Series - January 2025. EOS Ecology, Christchurch. 89 p.

EOS Ecology 2024. Lee River Focus Catchment Map Series – November 2024. EOS Ecology, Christchurch. 87 p.

EOS Ecology 2025. Lower Ruamāhanga Focus Catchment Map Series – May 2025. EOS Ecology, Christchurch. 107 p.

EOS Ecology 2025. Lower Waimakariri Focus Catchment Map Series – January 2025. EOS Ecology, Christchurch. 101 p.

EOS Ecology 2025. Lower Waipaoa/Te Ārai River & Wherowhero Lagoon Focus

Catchment Map Series – February 2025. EOS Ecology, Christchurch. 87 p.

EOS Ecology 2025. Maitai River Focus Catchment Map Series – March 2025. EOS Ecology, Christchurch. 91 p.

EOS Ecology 2025. Māngere Peninsula Focus Catchment Map Series – February 2025. EOS Ecology, Christchurch. 81 p.

EOS Ecology 2025. Manukau Harbour South Focus Catchment Map Series – January 2025. EOS Ecology, Christchurch. 85 p.

EOS Ecology 2025. Motueka/Riuwaka Focus Catchment Map Series – January 2025. EOS Ecology, Christchurch. 85 p.

EOS Ecology 2024. Moutere Inlet Focus Catchment Map Series – November 2024. EOS Ecology, Christchurch. 89 p.

EOS Ecology 2025. Ngaruroro River Focus Catchment Map Series – February 2025. EOS Ecology, Christchurch. 101 p.

EOS Ecology 2025. Ngunguru Bay Focus Catchment Map Series – January 2025. EOS Ecology, Christchurch. 85 p.

EOS Ecology 2024. Northern Wairoa River Focus Catchment Map Series – September 2024. EOS Ecology, Christchurch. 97 p.

EOS Ecology 2025. Nūhaka Coast Focus Catchment Map Series – May 2025. EOS Ecology, Christchurch. 91 p.

EOS Ecology 2024. Ōmaha Bay Focus Catchment Map Series – December 2024. EOS Ecology, Christchurch. 71 p.

EOS Ecology 2024. Pōrangahau Focus Catchment Map Series – September 2024. EOS Ecology, Christchurch. 87 p.

EOS Ecology 2025. Rakahuri/Ashley River Focus Catchment Map Series – April 2025. EOS Ecology, Christchurch. 99 p.

EOS Ecology 2025. Tākaka Focus Catchment Map Series – February 2025. EOS Ecology, Christchurch. 87 p.

EOS Ecology 2025. Tatapouri to Whangara Focus Catchment Map Series – April 2025. EOS Ecology, Christchurch. 87 p.

EOS Ecology 2025. Te Awa Kairangi/Hutt River Focus Catchment Map Series – April 2025. EOS Ecology, Christchurch. 99 p.

EOS Ecology 2025. Te Roto o Wairewa Focus Catchment Map Series – April 2025. EOS Ecology, Christchurch. 97 p.

EOS Ecology 2024. Te Whanganui a Tara/Wellington Harbour West Focus Catchment Map Series – October 2024. EOS Ecology, Christchurch. 91 p.

EOS Ecology 2025. Temuka River Focus Catchment Map Series – March 2025. EOS Ecology, Christchurch. 91 p.

EOS Ecology 2024. Tukituki Focus Catchment Map Series – September 2024. EOS Ecology, Christchurch. 99 p.

EOS Ecology 2025. Upper Hekeao/Hinds Focus Catchment Map Series – February 2025. EOS Ecology, Christchurch. 75 p.

EOS Ecology 2025. Upper Ōpihi Focus Catchment Map Series – April 2025. EOS Ecology, Christchurch. 91 p.

EOS Ecology 2024. Upper Waikirikiri/Selwyn Focus Catchment Map Series – November 2024. EOS Ecology, Christchurch. 87 p.

EOS Ecology 2025. Upper Waimakariri Focus Catchment Map Series – May 2025. EOS Ecology, Christchurch. 91 p.

EOS Ecology 2025. Upper Waioeka Focus Catchment Map Series - January 2025. EOS Ecology, Christchurch. 75 p.

EOS Ecology 2025. Waikanae Kāpiti Coast Focus Catchment Map Series – March 2025. EOS Ecology, Christchurch. 97 p.

EOS Ecology 2024. Waimārama & Ocean Beach Focus Catchment Map Series – September 2024. EOS Ecology, Christchurch. 87 p.

EOS Ecology 2025. Waitematā Harbour North Focus Catchment Map Series – April 2025. EOS Ecology, Christchurch. 91 p.

EOS Ecology 2025. Waitematā Harbour North-East Focus Catchment Map Series – April 2025. EOS Ecology, Christchurch. 81 p.

EOS Ecology 2025. Wakapuaka & Whangamoā Focus Catchment Map Series – March 2025. EOS Ecology, Christchurch. 97 p.

EOS Ecology 2025. Whakakaiwhara to Waimangō Point Focus Catchment Map Series – April 2025. EOS Ecology, Christchurch. 89 p.

EOS Ecology 2024. Whāngāpē Harbour Focus Catchment Map Series – October 2024. EOS Ecology, Christchurch. 73 p.
EOS Ecology 2024. Whangaroa Bay Focus Catchment Map Series – October 2024. EOS Ecology, Christchurch. 87 p.

EOS Ecology 2025. Wharekōpae River Focus Catchment Map Series – February 2025. EOS Ecology, Christchurch. 83 p.

Aerial Survey & Image Classification: HSC Braided River Project Management Area

The Hakataramea Sustainability Collective (HSC), a farmer-led group in South Canterbury, has been working with EOS Ecology (Shelley McMurtrie, Erron Henderson, Baily Lelieveld, Chris Wilson) to tackle the issue of invasive willow species in the Hakataramea River catchment. The HSC commissioned EOS Ecology to create a robust baseline for future monitoring and management. Instead of relying on traditional, labour-intensive ground surveys, we used Unmanned Aerial Vehicle (UAV) technology to produce high-resolution aerial imagery captured across a 405.3 hectare area. Using image classification and geospatial analysis of the captured imagery, we were able to classify land cover into seven categories, including willow species. This innovative approach provided the HSC with a precise and accurate understanding of the current willow extent, establishing a critical baseline for targeted control efforts. The project also focused on developing a scalable and repeatable workflow, ensuring that the analysis can be repeated after willow control efforts are implemented to objectively measure the project's success. This project demonstrates a transformative, low-cost approach to environmental monitoring, replacing traditional methods with precise, non-invasive UAV-based techniques. It also provides the HSC with the necessary data to inform adaptive management strategies and ensure the long-term restoration success of the Hakataramea River.

EOS ECOLOGY – HAKATARAMEA RIVER UAV SURVEY

Photo credit: EOS Ecology



Erron Henderson (EOS Ecology) & Natalie Sutton (HSC project lead) during Hakataramea River UAV survey. **Photo credit: EOS Ecology**

Osbornes Drain Catchment Management Plan

Shelley McMurtrie, Zoë Dewson, Ariana Painter, and Baily Lelieveld (EOS Ecology), along with Andrew Dark (Aqualinc), have been working closely with Selwyn District Council and the Osbornes Catchment Management Working Party (OCMWP) to develop a Catchment Management Plan (CMP) for the Osbornes Drain Land Drainage Scheme catchment. The CMP process began with our GIS team generating a more accurate waterways layer using lidar-derived Digital Elevation Model (DEM) data. This was ground-truthed during field surveys by the EOS Ecology Science team, which included Shelley McMurtrie, Ariana Painter, Emily Goldfinch, Catherine Grima, Helena Quilter, and Courtney Bosse.

Background research and analysis of spatial modelling, water quality, and ecological data enabled us to describe the historical and current state of the Osbornes catchment, and to identify key constraints, pressures, and challenges. Based on these findings, we recommended both broad catchment-wide approaches and a toolbox of targeted tools

and solutions to address the identified issues.

The next step in the CMP process is to develop a masterplan in consultation with the community, ensuring clarity around where the recommended tools and solutions should be implemented within the catchment.



'Nature Agents – Ngā Kaitaunaki Taiao'

Since rolling into Waitaha/Canterbury schools in 2018, our 'Nature Agents – Ngā Kaitaunaki Taiao' participatory science programme has been engaging students with real science. It aims to inspire students to continue making the sciences part of their education and life and connect schools with their local awa. Currently funded through the Ministry of Education's *Enriching Local Curriculum* programme, it gives students the chance to get out of the classroom and into the field, monitor freshwater health, and

contribute real data to an important regional dataset.

The programme has grown to involve more schools from across the region – from urban centres to rural communities. It provides long-term support so schools can continue monitoring year after year. The 'Nature Agents' ArcGIS Hubsite (www.natureagents.co.nz) has evolved into a place where schools map their results, explore other schools' data, and track changes over time. By combining hands-on science with tools that make data easy to explore and share, 'Nature Agents' is helping young people build skills, curiosity, and a deeper connection to their local environment

A 'Nature Agents' session at the Kanuka Trust School Day, Hekeao Hinds Hill Country Catchment Group, Mid-Canterbury. **Photo credit: EOS Ecology**

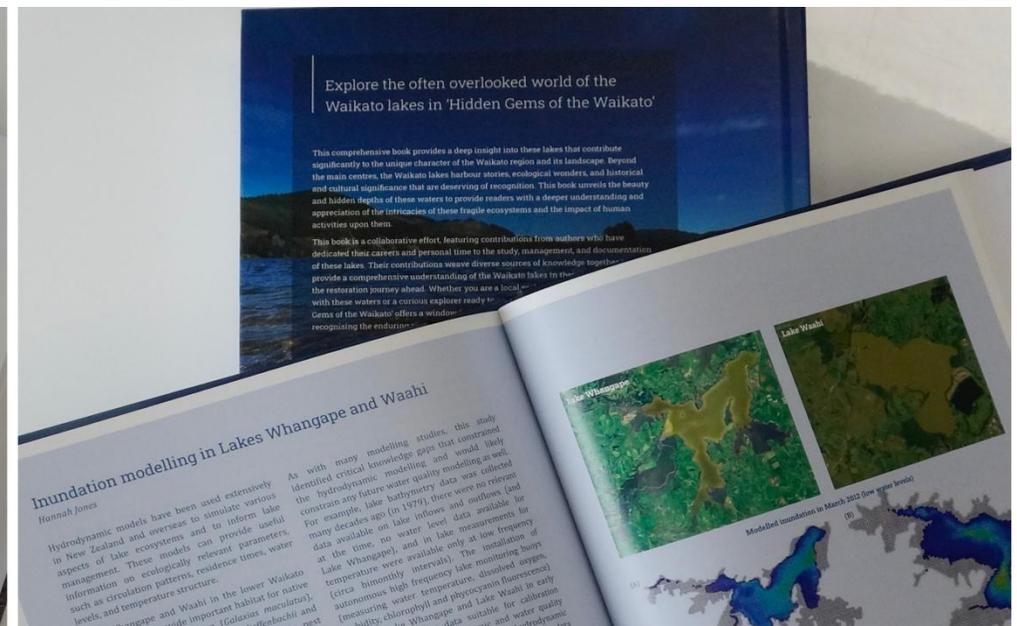
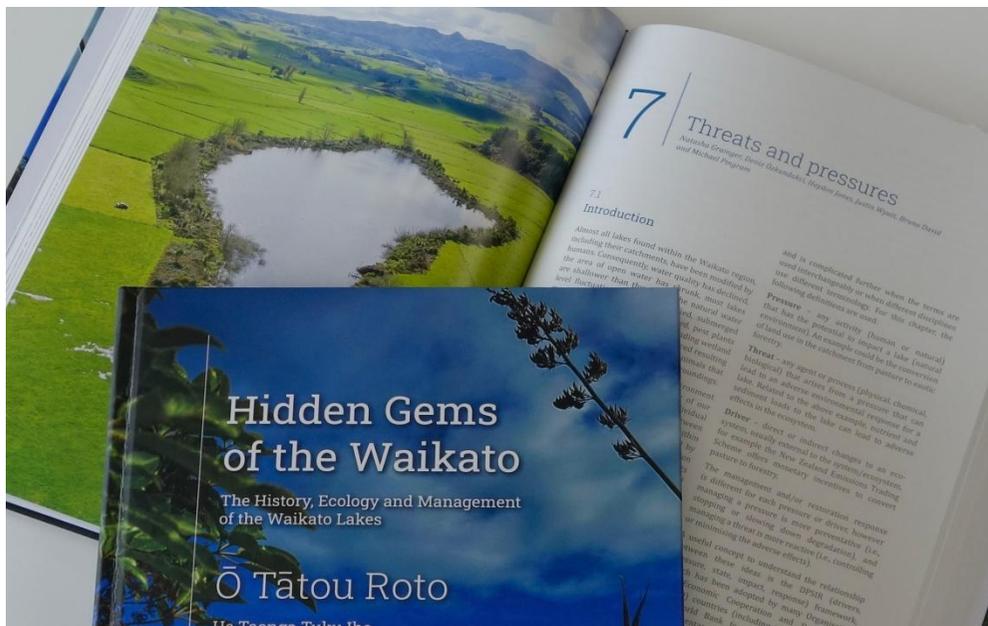
Hidden Gems of the Waikato

Bronwyn Gay has spent the last few years working with Natasha Grainger, Deniz Özkundakci, and Tracie Dean-Speirs on the design and layout of their *Hidden Gems of the Waikato* book. They're the editors of this passion project, which began during the COVID lockdown and evolved into a substantial publication with over 80 contributing authors. It's packed with scientific, local, and cultural insights about the Waikato Lakes, and the design needed to weave these varying styles of storytelling together visually. The thoughtful design helps showcase these stories about the region's unique freshwater ecosystems. If you haven't got your own copy yet, then head to www.thebestlittlebookstore.nz to get one while you can!

"Bronwyn has done an amazing job with the layout and design of the book. We are getting lovely feedback – everyone keeps telling us how beautiful the book is. Bronwyn is great to work with and I would recommend her to anyone needing a graphic designer for their publication." Natasha Grainger, Team Leader – Biodiversity, Integrated Catchment Management, Waikato Regional Council – Te Kaunihera ā Rohe o Waikato

Publications

Ozkundakci, D., Grainger, N. & Dean-Speirs, T. ed. 2025. *Hidden Gems of the Waikato – The History, Ecology and Management of the Waikato Lakes / Ō Tātou Roto – He Taonga Tuku Iho*. Hamilton, Waikato Regional Council & Te Tumu Whakaora Taiao – The Environment Institute, The University of the Waikato. 470 p.



Whanganui River Catchment eDNA Report

Following a 2021 review of fisheries and aquatic biodiversity in the Whanganui River catchment, EOS Ecology recommended that the Department of Conservation use environmental DNA (eDNA) techniques to update biodiversity knowledge in the region. This method is well suited to sampling even the remote parts of the large catchment. During 2023 and 2024, the Department of Conservation and local hapū collected eDNA samples from 16 sites, revisiting many locations previously surveyed in a 1998 catchment-wide macroinvertebrate study. Zoë Dewson, Baily Lelieveld, and Alex James then worked with the eDNA results to prepare a report and maps that summarised the project and enhanced understanding of fish distribution within the catchment.

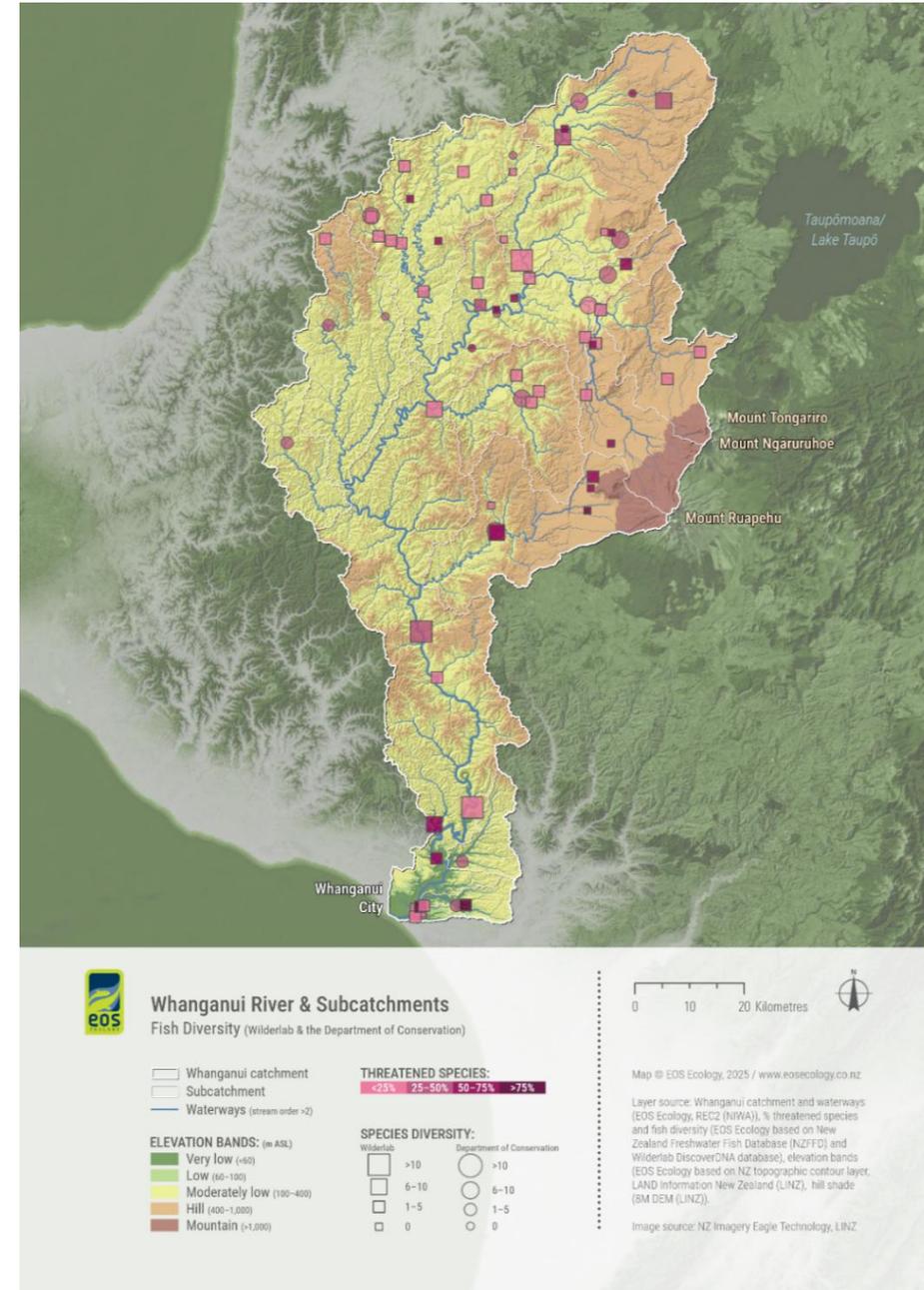
By integrating the new eDNA data with publicly available records from Wilderlab, we identified subcatchments with high or low fish diversity and identified gaps in sampling coverage, offering insights to guide future monitoring and conservation planning. Matching the eDNA results with the New Zealand Threat Classification System (NZTCS) also allowed us to report on subcatchments where species of conservation interest were detected, including shortjaw kōkopu, piharau/lamprey, longfin eel, torrentfish, whio/blue duck, kākahi/ freshwater mussel, and long-tailed bat. The Taxon Independent Community Index (TICI), calculated by Wilderlab as a measure of ecological health, revealed a general trend of higher scores in headwater sites compared to mainstem and downstream tributaries, with a few exceptions to this pattern suggesting areas of potential human impact.

Publications

Dewson, Z. 2025. Whanganui River Catchment: eDNA Survey 2023–2024. EOS Ecology Report No. DEP01–24105. 56 p.

Dewson, Z. 2021. A Review of Fisheries & Aquatic Biodiversity Information for Te Awa Tupua/Whanganui River. EOS Ecology Report No. DEP01–21005. 31 p.

Fish diversity map from the Whanganui River Catchment: eDNA Survey 2023–2024 report. **Photo credit: EOS Ecology**



Urban Fish Community Data Analysis & Community Group Water Quality Data Reporting

Various EOS Ecology staff (Alex James, Chris Wilson, Ariana Painter, Baily Lelieveld, Bronwyn Gay) have been involved in a project to assist Greater Wellington (GW) to better understand the fish communities of the heavily urbanised Wellington City Council (WCC) and Porirua City Council (PCC) areas. This has included:

1. compilation of fish data from three sources (GW surveys, NZFFD, and publicly available Wilderlab eDNA) and production of a site map and associated GIS layers of survey sites
2. production of a GW-branded native freshwater fish poster of species found in the WCC and PCC areas for use at public events
3. undertaking an initial spatial review of fish data to determine key research questions and suspected drivers of fish community structure
4. creating a detailed data analysis outline to address key research questions.



Alex James and Bronwyn Gay, with GIS assistance from Baily Lelieveld, have also completed data analysis and reporting on a small water quality data set for the GW-supported Upper Waipoua Kaitiaki Group (UWKG). Between December 2021 and February 2024, four rounds of water quality sampling were undertaken across seven sites in the Upper Waipoua River catchment. In addition to physico-chemical sampling (turbidity, dissolved reactive phosphorus, nitrate, and *E. coli*), macroinvertebrate surveys were carried out at all sites, and environmental DNA (eDNA) samples were collected from two locations to assess biodiversity. To communicate findings effectively, spatial infographics were developed to visualise water quality parameters across sites and sampling events and compared to relevant guideline values. The final report also integrated data from a GW SOE site, records from the NZFFD, and public record eDNA results, providing a broader ecological context. Recommendations for future monitoring and catchment management actions were included. In addition to focusing on science communication, the report format was designed as a replicable template for the presentation of small-scale datasets from other community groups within the Wellington region, enabling consistent interpretation and reduced reporting costs.

Publications

James, A., Gay, B., & Valois, A. (2025). Upper Waipoua Kaitiaki Group – Water Quality & Biomonitoring Summary 2024. EOS Ecology Report No. GRE01-23080. EOS Ecology, Christchurch. 27.p.

Whanganui River Mouth Infrastructure Upgrades

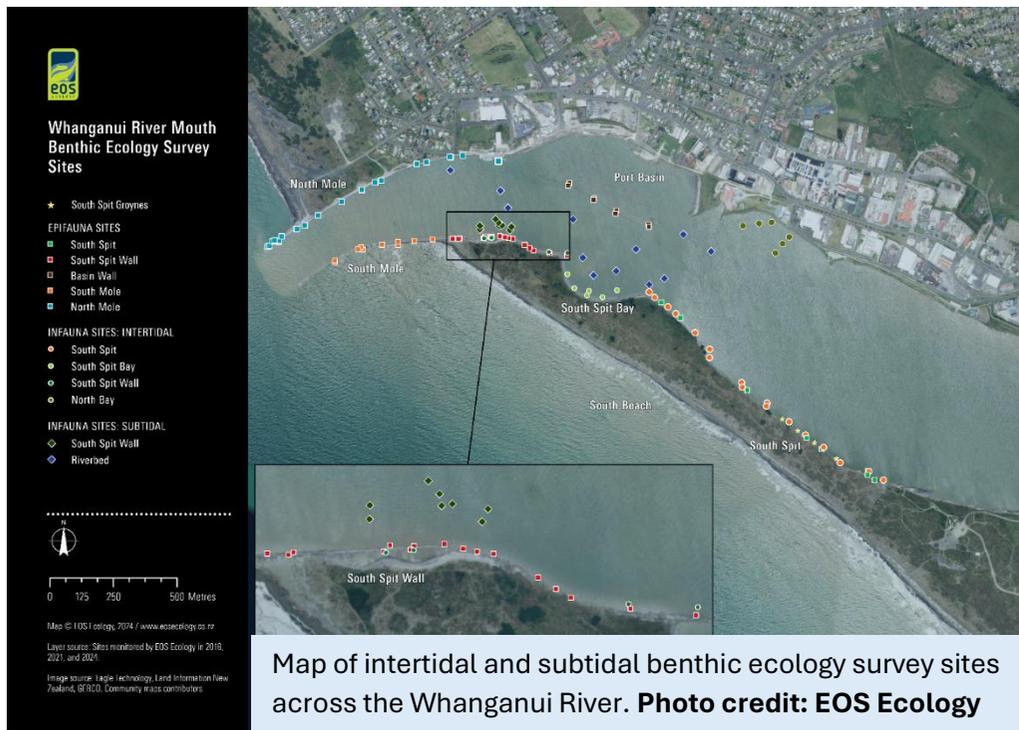
As part of Te Pūwaha, the Whanganui Port revitalisation project, construction is now underway on the South Mole reinstatement at the mouth of the Whanganui River. This phase

of the project is being led collaboratively by hapū collective Te Mata Pūau and Horizons Regional Council, with support from Kānoa – Regional Economic Development & Investment Unit.

supporting hydraulic flushing of the river mouth.

EOS Ecology has played a key role across multiple phases of the project, contributing expertise in river, estuary, and coastal ecology. In the current phase, which focuses on infrastructure along the true left bank of the river mouth, EOS scientists Jesse Burns, Nick Hempston, and Shelley McMurtrie have conducted intertidal and subtidal surveys to characterise benthic ecology and inform environmental impact assessments.

These assessments have guided the evaluation of construction methodologies and enabled adaptive management in response to dynamic river conditions. EOS Ecology has also proposed design enhancements aimed at improving ecological function and promoting aquatic biodiversity within the upgraded infrastructure.



The reinstated hard structures, including the South Mole embankment and Tanea Groyne, are designed to protect the South Spit and stabilise the river's course. These features will also help maintain a small downstream sand bank, reducing wave energy intrusion from the sea and

Publications

- Burns, J. 2024. Whanganui River Mouth South Spit: Aquatic Assessment of Environmental Effects. EOS Ecology, Christchurch. EOS Ecology Report No. CAT02-24095-01. 51 p.
- Burns, J. & Hempston, N. 2025. Whanganui River Mouth Tanea Groyne: Addendum Aquatic Assessment of Environmental Effects. EOS Ecology, Christchurch. EOS Ecology Report No. HOR01-25018-02. 43 p.
- Burns, J. & Hempston, N. 2025. Whanganui River Mouth South Mole: Addendum Aquatic Assessment of Environmental Effects. EOS Ecology, Christchurch. EOS Ecology Report No. HOR01-25018-01. 29 p.

Waitaha River Hydro Scheme

The EOS Ecology team (including Shelley McMurtrie, Catherine Grima, Alex James, Ariana Painter) were approached by Westpower to provide technical input for a resource consent application in the Waitaha River catchment for a run-of-the-river hydro scheme to provide local power. With familiarity of the catchment based on previous investigations, we supplemented our past comprehensive algae, fish, and invertebrate surveys with a widespread eDNA sampling programme. This was used to confirm the absence of all but kōaro upstream of the natural barrier of Morgan Gorge and to check for the presence of any threatened species, particularly freshwater invertebrates which are not often able to be identified to species level via the larval stage.

The value of expert site knowledge and critical interpretation of eDNA data to remove false positive results was confirmed when a very weak eDNA signature for salmon was recorded in a seepage habitat with no surface water connection, and upstream of a significant fish passage

barrier. In addition to providing a freshwater ecology AEE report, we developed a Freshwater Ecology Management Plan for the scheme, contributed to the proposed consent conditions and other related plans, and contributed to a series of community engagement evenings across the West Coast to help give further information to the wider community.

Publications

McMurtrie, S. & Grima, C. 2024. Proposed Waitaha Hydro Scheme: Summary of freshwater biota records from eDNA sampling. EOS Ecology Report No. WES05-24011-01. EOS Ecology, Christchurch. 29 p.

McMurtrie, S. & Grima, C. 2025. Westpower Ltd Proposed Waitaha Hydro Scheme Assessment of Environmental Effects: Freshwater ecology. EOS Ecology Report No. WES05-24011-02. EOS Ecology, Christchurch. 112 p.

Shelley McMurtrie and Catherine Grima collecting eDNA samples from the upper Waitaha River catchment. **Photo credit: EOS Ecology**



Newsletter Issue November 2025



New Zealand Freshwater Sciences Society
Ngā Kohinga Wai o Aotearoa

Contents

Newsletter Contents	2
From the Editor	3
President's reflection	4
STUDENT REPRESENTATIVES	7
RŌPŪ MĀORI UPDATE	8
Feature Article: A New Lens on Aotearoa's Catchments	13
ORGANISATION UPDATES	16
University of Canterbury (FERG)	17



LINCOLN UNIVERSITY
TE WHARE WĀNAKA O AORAKI

LINCOLN UNIVERSITY	24
University of Otago	30
Earth Sciences New Zealand	36
Cawthron Institute	44
Cawthron Publications:	50
ORGANISATION UPDATES Government agencies	52
Auckland Council	58
Waikato Regional Council	61
Taranaki Regional Council	65
Gisborne District Council	67
Greater Wellington Regional Council	68
Canterbury Regional Council	70
Feature projects	70
Publications	72
Department of Conservation	73
Wildlands	82
New Zealand Freshwater Sciences Society	82
Publications:	83
Tonkin and Taylor Organisation update	84
Tonkin and Taylor Feature projects	85
Publications:	86
EOS Ecology	87

