flow

manatiaki kōawa
rivers
GROUP

A joint technical interest group of Engineering New Zealand & Water NZ

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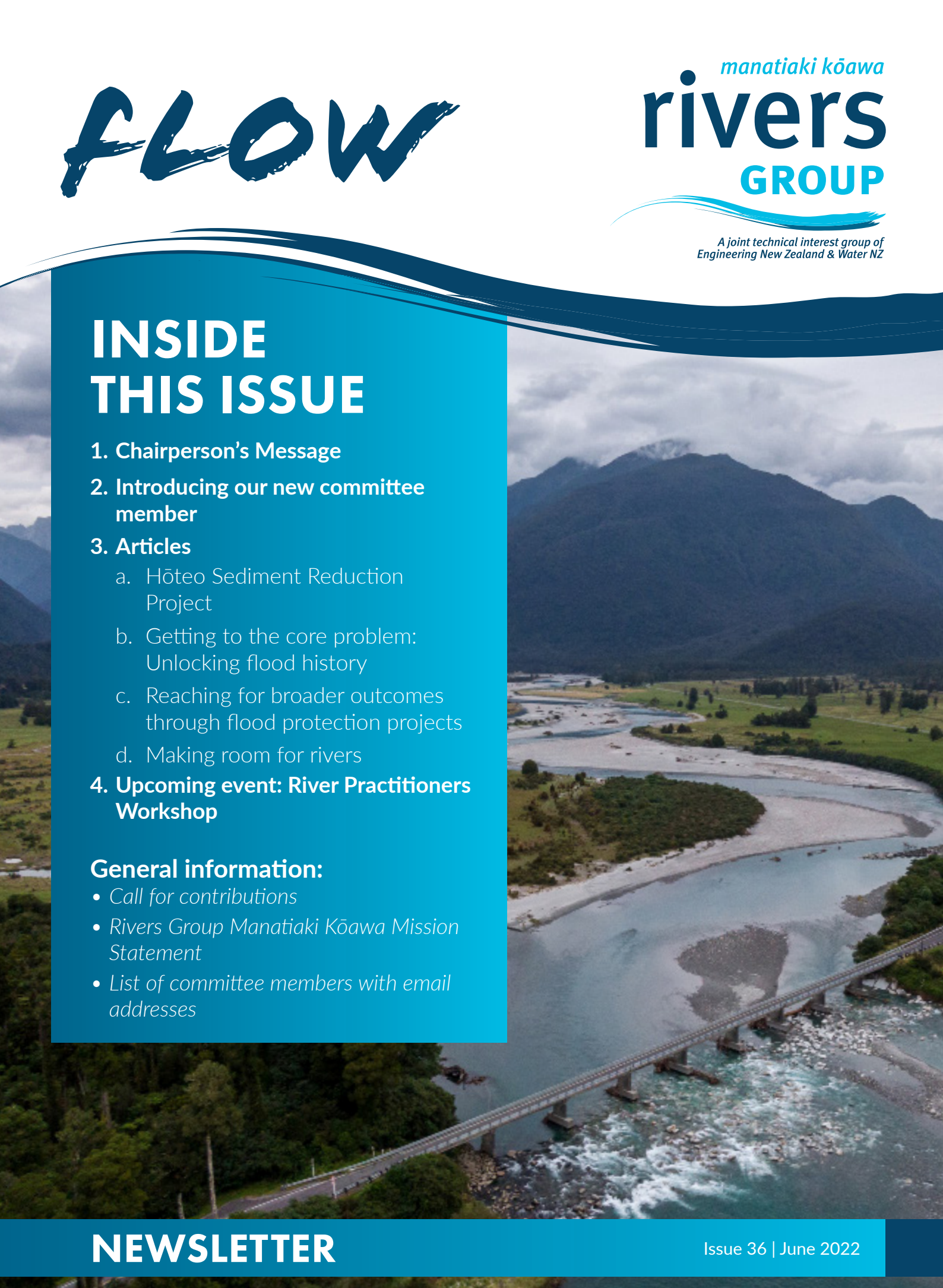

NEWSLETTER

Issue 36 | June 2022

MESSAGE FROM THE CHAIR

Selene Conn

Kia ora koutou!

I cannot believe it is halfway through the year already. 2022 has certainly posed a few challenges, but it has been inspiring to see how our community has shown amazing resilience and innovation. We saw some pretty wild weather across the country in early June, with MetService recording 21,500 lightning strikes over land and water in 12 hours, and multiple bands of thunderstorms brought heavy rain and strong winds to both the North and South Islands, and snow in the Southern Alps. The Westcoast, Wellington, and Horizons flood rooms were activated (just to name a few), and from conversations with some of you, it sounded like very little sleep was had by those who work with rivers, and those who live beside rivers in these regions. There were numerous reports of flash and surface flooding, with some areas requiring evacuation.

Flash flooding was also recorded in March in Auckland, with a short but extremely intense rainfall being labelled one of the wettest hours on record. Surface floodwaters were so deep and extensive in several suburbs that emergency services stepped in to help manage traffic, but this didn't prevent some cars becoming submerged in floodwaters in Ellerslie.

I am sure all of us in the Rivers Group feel for the Westport community, as they have experienced more than their fair share of flooding over the last year. Its great to see the Westport Flood Resilience Business Case is taking steps forward, with the options being released to the public. It is heartening to see the Business Case "outlines a mix of protect, avoid, adapt and retreat options and priorities, the full range of solutions that are needed to make Westport more resilient to future floods, both now and in the future."

I am not a meteorologist or a climate scientist and therefore cannot comment on these events in terms of precedent. However, these events have been very much front and centre of my mind recently, and I have been thinking about how we are preparing to face the challenges a changing climate will bring. These recent events are highlighting the unpredictability of weather associated with our changing climate, and (to quote some River Practitioners from this piece in The Conversation) "we can no longer treat our rivers as static, in the hope of making them more predictable.". A 2018 article from the US stated "A series of analyses have helped confirm what engineers have posited for more than a century: that earthen levees built along the river are increasing flood risk for everyone, and especially hurting those who live across from them.".

Understanding how our rivers respond to floods (including successive flood events), understanding the resilience of the wider catchments and how this might affect river response, and using this information to work WITH our rivers, is going to be critical to 'increase flood resilience' moving forward. This is going to require a collective effort involving community, mana whenua, local/district councils, regional councils, central government, academics, ecologists, geomorphologists, water/civil engineers and the wider industry of contractors, resource suppliers, and nurseries that often support river works. This amount of collaboration will ultimately come with some challenges, it's no mean feat. But I believe our River Community will be able to achieve great things in this space as we bring our strong communication and dedication to innovation to the table!

Continued onto the next page...

MESSAGE FROM THE CHAIR

Selene Conn

Lastly, I would like to remind you, if you have something you'd like to share in our newsletter FLOW, get it to us anytime (rivers.group@engineeringnz.org)! We are more than happy to save up contributions we receive throughout the year to put into the next FLOW. Keep an eye out for the early email reminders for contributions, keep checking for updates and connect with us through our Website, Facebook, Twitter and LinkedIn.

Nga mihi nui and stay well.

Selene Conn
Chair

INTRODUCING OUR NEW COMMITTEE MEMBER

Clare Wilkinson

Rivers Group Young Professionals Coordinator

Clare Wilkinson is a fluvial geomorphologist at Tonkin & Taylor. She has recently joined the Rivers Group committee as the Young Professionals Coordinator, with the aim of connecting industry practitioners and consultants with bright young minds at universities. Clare recently completed her PhD at the University of Canterbury. Her research involved braiding mātauranga Māori and fluvial geomorphology to better understand landscape response to major disturbances, such as earthquakes. Clare is excited to assist with building connections between university and industry leaders in the river management space.

You can learn more about the whole committee at https://riversgroup.org.nz/committee/

ARTICLE:
HŌTEO SEDIMENT REDUCTION PROJECT: GEOMORPHOLOGY, AND ANCHORING MĀTAURANGA MĀORI ALONGSIDE GEMS

S. Nolan, S. Speed, T. Stephens (Auckland Council)

ABSTRACT

The purpose of this article is to showcase the alignment of the western science and Te Ao Māori paradigms in an operational context, informed by the Hōteo Sediment Reduction Project (Hōteo Project). There has been a general understanding, generally borne from respect to Te Ao Māori, that the two world views may only work in parallel, acknowledging and respecting the tikanga and mātauranga of Te Ao Māori. The learnings undertaken in the Hōteo Project have shown that there is a space in which the two world views may work together, creating space for both to inform the leadership and define the deliverables of a project, and how it may fit into the wider kaupapa of the mana whenua of the area.

Geomorphology takes a holistic, catchment wide view – following the waters journey from mountain to sea, e.g., what is happening in the catchment to cause the localised issues? It looks at driving forces (factors that cause erosion) and the associated strength of resisting forces (forces that prevent erosion). Te Ao Māori has a similar, but more complex view which acknowledges the interconnectedness of all living and non-living things. When attempting to understand the interconnectedness of the Māori world view and how geomorphology may align with it, one needs to go back to the very beginning, to the story of creation with Papatūanuku (Earth Mother), Ranginui (Sky Father) and the strong driving forces that led to their unwanted separation. The associated ongoing internal conflicts between Tane Mahuta (God of the Forest) who was responsible for the final act of separating his parents with all his strength and power, and Tawhirimatea (God of the Weather) and Tangaroa (God of the Sea) who disapproved of Tāne Mahuta's deliberate actions. Streambanks, terrestrial environments and coastal forest areas of Tāne Mahuta continue to erode through the powerful winds of Tawhirimatea and the powerful waters of Tangaroa across Aotearoa in anger and disapproval.

DRIVING FORCES VS RESISTING FORCES

Te Ānga mai o Tawhirimatea me Tangaroa

Me te tāwhana o Tāne Mahuta

Translation

The driving forces of Tawhirimatea and Tangaroa

And the resilience of Tāne Mahuta

Geomorphically Effective Management Solutions (GEMS)

Sediment is a universally important contaminant, affecting both freshwater and coastal environments, with instantaneous and long-lasting effects. Once erosion occurs reducing ongoing sediment loss is incredibly challenging. Erosion takes years to decades to address, with sediment having decadal and longer effects instream and at coast, across the spectrum of cultural, ecosystem and human health.

Not all sediment is equal. Finer sediment (<63 µm) is more critical, often generating poorer water quality outcome than an equivalent amount of coarse sediment – whether in terms of water clarity, fish passage, nutrient regeneration, growth of high-value ecosystem habitat or ultimately, mahinga kai.

When looking at erosion, particularly streambank erosion, the driving forces and resisting forces need to be understood to determine the most suitable mitigation options to implement. Driving forces relate to the factors that cause erosion (volume of water in the channel, velocity of flow, gravity, weather, etc), whereas resisting forces are those that prevent erosion (root reinforcement from riparian vegetation, strength of soil particles on the streambank (cohesiveness), etc). If the driving forces are higher than the resisting forces, erosion occurs.

In an investigation carried out by Auckland Council in partnership with independent geomorphologists (Cardno US), streambank erosion contributed more than two thirds (72%) of fine-grained sediment carried by the Hōteo River into the Kaipara Moana, a renowned taonga. The primary cause of the Kaipara Moana's degradation is excessive sediment - the principal cause for loss of productive shellfish and seagrass habitats (Green and Daigneault, 2018). Still higher estimates have been published by NIWA, that 93-100% of fine-grained sediment discharged by the Hōteo originated from stream erosion (Hughes et al., 2021). Contrast the recent science with the long-held view by land managers and remediation programmes that erosion is predominantly land-based – a view resulting in limited simple options for a complex and critical problem (e.g., stock exclusion and/or riparian planting). That contrast is why the Hōteo Project implemented.

The Hōteo project is a 5-year project, co-funded by Auckland Council (AC) and the Ministry for the Environment's Freshwater Improvement Fund. AC has partnered with Ngāti Manuhiri, Ngā Maunga Whakahi o Kaipara and Te Uri o Hau (Kaipara Uri) in co-leadership, which has led to greater alignment of Te Ao Māori and Western Science outcomes being delivered simultaneously, to the challenge of how best to manage for stream erosion.

The Hōteo project has identified a range of Geomorphically Effective Management Solutions (GEMS) to be trialled at locations along a 12-km stretch of the Kourawhero Stream in the Hōteo River Catchment, to stabilise stream banks and reduce fine-grained sediment loads from entering the Kaipara Moana. GEMS are a toolbox of mitigations to modify the geomorphology for the purpose of reducing erosion - including but going beyond stock exclusion and untargeted riparian planting. GEMS include solutions to work with stream hydrology, profile and soil characteristics and to identify effective solutions that take into account the risk and form of the stream.

Figure 1 – Large bank failure on the Kourawhero Stream – Scott Speed for size reference

Figure 2 – Before, During and After photos of GEMS implementation

Figure 2 gives an example of GEMS at work. The bank was originally bare, had a 90 degree angle and was actively eroding. The GEMS selected to be implemented at the site included bank battering, plus specific native species chosen for the rooting systems to protect the bank. Applying the GEMS framework, meant being able to precisely target a hotspot, for a critical contaminant and ensure a managed solution that's both feasible and effective – more so, than simply fencing and planting. The site was on private land, so the aspirations of the landowner were also incorporated. Bank battering was needed, because planting alone was insufficient to protect the loosely consolidated and steep bank from undercutting. While this is a simple example, it shows the benefit of a holistic approach to restoration and includes a range of mitigations from the GEMS toolbox.

The primary function of GEMS is to address imbalances between the forces that cause erosion, relative to those forces that resist erosion. GEMS aim to reduce hydraulic driving forces such as boundary shear stress (e.g. stress of flow on the streambank) and geotechnical driving forces (e.g. bank angle and gravity), while reducing hydraulic forces and/or increasing boundary resistance.

GEMS range from low impact "natural solutions" such as riparian fencing/planting and large tree trimming/removal to more physical "engineering projects" that involve earthworks to re-contour streambanks and channels or use of imported materials to provide additional strength and support to hotspots.

The GEMS selected to be trialled on four representative sites in the Hōteo project include:

- Bank battering
- Log weirs
- Rock toe protection
- Re-purposing fallen trees in-stream into the toe of the bank
- Specific erosion mitigating plants (informed through the Te Paiaka – Native Root Project)
- Stock exclusion through fencing
- Grade control structures

One of the primary outcomes of the project is to trial GEMS that are yet to be implemented in New Zealand, showing their efficacy, cost effectiveness, ease of construction (do they trigger consents?) and replicability on private land. In addition, with standard practice such as riparian fencing and planting, GEMS have delivered significant and cost-effective sediment reduction internationally, highlighting the need for a trial in Aotearoa. We are also investigating how we can improve existing methods like riparian planting by refining which species to plant where along streambanks and measuring the tensile strength and root architecture provided by our native riparian species and assessing above-ground growth form such as channel roughness and resistance to flow during flood events. This is being investigated through Te Paiaka – Native Root Project.

Figure 3 – Tumanako Povey, one of the project kaitiaki on the river survey

A key learning for the Hōteo project, which is about to enter the final year, has been the alignment and complementary paradigms of geomorphology and both Te Ao Māori and mātauranga Māori. Both paradigms look at restoration from a holistic approach and note how the wider system collaborates and impacts the localised site being restored. If the restoration is to be successful, the intricacy of the natural environment needs to be considered and balance restored.

In Te Ao Māori, a river is not understood as a collection of its measurable parts, but as an interconnected and living being. 'Through Māori eyes, rivers are generally seen as whole and indivisible entities, not separated into beds, banks and waters, nor into tidal and non-tidal, navigable and non-navigable parts. Through creation beliefs, the river is a living being, an ancestor with its own life force, authority and prestige, and sacredness' (Te Aho 2010).

Geomorphologists also view rivers as connected systems and understand the importance of the upstream and downstream environment, the surrounding land, the natural forces of weather and the role of people in contributing to the management of a single site.

Through this understanding of the complementary world views when it comes to river restoration, the iwi/hapū involved have been able to incorporate a cultural lens to the project and to geomorphology that was not understood prior to the project inception. This has been an evolving space in the project and has risen way to a Cultural Monitoring Framework that goes beyond the current scope of the project, incorporating the wider aspirations of the iwi/hapū. Many iwi and hapū have been disconnected from te taiao (the natural world) and their cultural practices, as a result of historic land confiscations and post-colonial cultural assimilation. As Auckland Council are partners into enacting Te Tiriti o Waitangi, this was a hard truth that needed to be acknowledged in order to create a relationship of trust. Thus, the cultural health monitoring developed was a significant step into acknowledging a better future and represents more than just collecting field data – it is also about (re)instating and enacting rangatiratanga, kaitiakitanga and mātauranga Māori, and AC's commitment to supporting and partnering with this mahi.

Figure 4 – Initial Project Steering Group (note we have had a change in a partner reps over the years)

A Project Steering Group (PSG) made up of representatives from Ngāti Manuhiri, Ngā Maunga Whakahi o Kaipara and Te Uri o Hau, along with industry representatives, was formed from the outset of the project.

The aim of the PSG is to 'enhance the impact, effectiveness and reach of the sediment reduction initiatives in the Kourawhero Stream through sharing perspectives, experience, knowledge, resources and networks and to ensure our respective work programmes are aligned and synergistic'. In addition, the hapū representatives agreed to 'support the development of the mātauranga Māori component of the project' (sourced from the Mana Enhancing Agreement developed for the project). It is our mana whenua partners that have brought the knowledge and mātauranga that has given rise to the alignment between geomorphology and Te Ao Māori and it is them that needs to be acknowledged as we progress further into this aligned space.

Kaitiaki have been engaged in the project in multiple ways:

- Mana Enhancing Agreement signed in the first year, setting out the intention for partnership for the project
- GEMS sites identified and chosen in partnership with mana whenua partners
- Iwi work plan developed by Manaaki Whenua – Land Care NZ
- Cultural Monitoring Framework developed by Manaaki Whenua (as suggested by the iwi work plan)
- Upskilling of kaitiaki in GEMS monitoring (paid work), with the intention kaitiaki lead monitoring works for 10+ years
- Cultural Monitoring training/knowledge share with kaitiaki being paid to do cultural monitoring alongside GEMS monitoring for 10+ years
- Kaitiaki paid to do planting and maintenance. All paid works in the project offered to mana whenua first
- Iwi nurseries as a main supplier of plants for the project
- Relationships have been built between kaitiaki and landowners – cultural history of the area has been retold
- Regular Project Steering Group hui to guide the project and our intentions for the following period.

CONCLUSION

When an environmental project gives space and enables local hapū/iwi to take a leadership approach in the deliverables and outcomes being achieved, the alignment of western science and Te Ao Māori is a natural outcome. Geomorphology is an example of a scientific approach that can be anchored into mātauranga Māori, but it is not on its own. The largest learning we have achieved in the Hōteo project is the benefits and complementary outcomes that comes when partnering with iwi/hapū. Bringing in cultural and social outcomes to an environmental project did not take away from the kaupapa of piloting different GEMS to reduce fine-grained sediment, but allowed for kaitiakitanga to be incorporated into everything we did. The mātauranga of the area and of the people who have lived on the land for centuries is a sacred thing, and if we are to be genuine in our partnership with mana whenua, this needs to be acknowledged at the outset of the project.

Essential Freshwaters Te Mana o te Wai will require a change in approach for how water resources are managed in Aotearoa. Under the new Hierarchy of Obligations, the mauri of water bodies and freshwater resources is given first priority. This will require an adjustment to the current workforce involved with managing water services and more emphasis given to improving the health of natural systems. The Hōteo Project is well aligned with this adjustment and is a key example of the importance of the new national direction.

The collaborative approach of the Hōteo project is now being used to inform other restoration projects such as the Kaipara Moana Remediation Programme, as an example of the benefits of bi-cultural leadership in a large-scale project. While geomorphology is an ever-evolving science in Aotearoa, Te Ao Māori and mātauranga Māori have been known and practiced by tāngata whenua for centuries. Within the Hōteo project, we are extremely privileged to learn and implement some of that knowledge.

Ko au te awa, ko te awa ko au (I am the river, the river is me).

ARTICLE:
REACHING FOR BROADER OUTCOMES THROUGH FLOOD PROTECTION PROJECTS

S. Westlake[1], S. Stacey[1], M. Beagle[1], M. Aliprantis[2]
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[Excerpt adapted from THE NEW REALITY – SHIFTING VALUES IN FLOOD RISK MANAGEMENT, written for the Flood Plain Management Australia 2022 conference]

Historically, flood protection has been regarded as an engineering discipline, manifested by the development of infrastructure designed to protect the lives and assets of riverside and floodplain communities. While this remains at the core of flood protection, views are fast moving towards a more holistic approach that leverages the flood protection process to achieve broader social and community objectives.

Nowhere is this new thinking better expressed than in government's Resilient River Communities Programme, which has provided funding for 55 flood protection projects spanning 14 different councils.

While the programme is aimed at building resilience to the threat of flooding and boosting the Covid economic recovery, it is much more than that. By working with central government agencies invested in developing our regional economies, such as Kānoa – Regional Economic Development & Investment Unit, regional councils have been better equipped to achieve these greater outcomes.

Greater Wellington's Climate Resilience Programme forms part of this new thinking and is the first of our flood protection programmes to explicitly incorporate these broader outcomes, in this case through more than fourteen different initiatives.

Central to our approach is community wellbeing, and two of our main initiatives support the mental and physical wellness of workers for our main contractor, Mills Albert Limited (MAL), a local, Māori owned business from Kapiti Coast.

MAL have been very enthusiastic about worker wellbeing and through this project Greater Wellington has enthusiastically provided the platform and financial support to develop ideas and initiatives to enable MAL to support their workers in new ways.

Starting discussions around mental health is an essential step towards reducing the historical stigma around the topic. With MAL now focusing on mental wellbeing, they hope to influence culture change, which is especially important given the construction sector has the highest rates of suicide across Aotearoa New Zealand.

MAL is implementing an extensive mental wellness program: they're creating policies and procedures around mental health, hosting resiliency workshops, and providing mental health training for their workers.

In a holistic approach, to support physical worker wellbeing for a workforce that's predominantly middle-aged, Māori, and male, working with a local medical centre, MAL will launch an annual prostate screening program later this year. This initiative was inspired by another contractor that had recently started a similar programme. It has had great uptake and is already directly impacting the health of multiple workers – with positive test results coming back. Greater Wellington, aligning with the project's broader outcomes, is now supporting MAL to do the same.

Greater Wellington is also focussing on worker career development through connecting MAL with local iwi, Ngāti Toa. Since then, their relationship has blossomed,

resulting in MAL employing three people from the local Pā: one engineer, and two spotters.

Going one step further Greater Wellington is also supporting workers to gain certification and progress their careers. For example, broader outcomes funding is helping a wāhine Māori youth worker to gain certification in her passion, which is business.

A third area of focus for broader outcomes is that of environmental benefit, a key element of Greater Wellington's mandate. In this program, we have approached it with a different perspective: merging our environmental initiatives with cultural, tangata whenua-led initiatives.

Collaboration with Ngāti Toa has led to a rongoā garden (traditional Māori healing or medicinal system) being included in one of the projects. The plant selection and design has been carried out in partnership with Ngāti Toa as well as Greater Wellington's consultants. It will be planted in a popular community park complete with information panels about the importance of rongoā, and members of the local iwi will be able to collect plants and teach their tamariki for generations to come.

We've also been involved in restoration of a wetland in the Wairarapa, at Wairarapa moana (Lake Wairarapa), which has been facilitated as part of this programme, an area of great importance to Greater Wellington and iwi partners in the Wairarapa.

Also, some 65,000 native plants will be planted at project sites along Te Awa Kairangi / Hutt River and the Ruamāhanga River in an effort to restore local biodiversity and mitigate the flood protection program's carbon emissions.

Implementation of Kānoa's broader outcomes programme has brought with it new understanding and key lessons have been leaned. In essence, to successfully support the community, you need to listen to its needs. Our role is to be the spark, the one who brings the encouragement, and then to let the community lead the ideas. They're the ones that can grow the seeds and nurture them into the future.

Through this programme, Greater Wellington has been able to bring people together, forming relationships that we expect will continue into the future, even without us – which is the aim, creating sustainable, long-term benefits which are wider than those achieved by completion of engineering projects.

ARTICLE:
MAKING ROOM FOR RIVERS

We need to change the way we think about flood protection infrastructure to help rivers adapt to a changing climate. By Tom Kay, Forest & Bird's freshwater advocate. (Another version of this article was published in the Winter 2022 Forest & Bird magazine).

In June 2021, 551mm of rain fell on the Canterbury foothills over three days – the greatest intensity ever recorded in the area. Waters in the Ashburton / Hakatere Awa rapidly rose to a peak of 1794 m3/s – the highest flow the river had experienced since the installation of the recording gauge at State Highway 1. While it wasn't (quite) enough water to overwhelm the stopbanks protecting Ashburton, it was more than enough to overwhelm the banks built in more rural areas, which had never been designed to handle such high flows. Floodwaters damaged houses and farms, cut off small towns, closed roads and the rail line, and took out fences, bridges, irrigation equipment, and stock feed. Over 200 households (and 300 people) were evacuated, 32 houses were damaged, $5 million of damage was done to roads, and 3,800 insurance claims (requesting $46.4 million) have been made since.[1]

It's a story that we've seen before and since. In March, Gisborne received three months' worth of rain in 24 hours,[2] with rivers breaching banks, taking out bridges, and causing widespread damage.[3] Central Hawke's Bay experienced serious flooding – albeit slightly less intense – around the same time. In 2021 it was Westport, with the Buller River reaching the highest flows (7640 m³/s) seen since 1926, prompting a mass evacuation and leaving hundreds of homes unliveable.[4] In 2019, it was Canterbury, where the Rangitata River overwhelmed flood 'protection' and jumped back into its south branch – where it hadn't flowed for 24 years, effectively cutting the South Island in two and doing millions of dollars' worth of damage.[5] That same year saw the Waiho and Fox Rivers take out a bridge and tear open a landfill. In 2017, it was Edgecumbe, where the entire town was forced to evacuate,[6] and in 2015, Whanganui, after the river experienced its largest recorded flood, prompting hundreds of evacuations and damaging more than 100 homes.[78]

In Aotearoa, we've tried to protect our communities from these sorts of floods by 'engineering' our rivers into massive drains. We've used diggers and bulldozers to straighten them, deepen them, and line them with rock groynes and stopbanks, all in the hope this will 'stabilise' them – keeping floodwaters away from communities and draining them out to sea as quickly as possible.

1. https://www.lgnz.co.nz/assets/Regional/002-Central-Government-Co-Investment-in-Flood-Protection-January-2022_ADVANCED-COPY-EMBARGOED-3PM-6-APR-22.pdf
2. https://www.1news.co.nz/2022/03/23/live-gisborne-hit-by-3-months-worth-of-rain-in-24-hours/
3. https://www.rnz.co.nz/national/programmes/checkpoint/audio/2018835551/weather-gisborne-remains-cut-off-after-heavy-rain-slips-floods
4. https://www.rnz.co.nz/news/national/453511/westport-flood-450-homes-still-unlivable-or-damaged
5. https://www.stuff.co.nz/timaru-herald/news/123562445/rangitata-river-flood-costs-are-ongoing-12-months-later
6. https://www.rnz.co.nz/news/national/328386/edgecumbe-flood-draining-town-could-take-weeks
7. https://www.rnz.co.nz/news/regional/305308/whanganui-flood-was-1-in-130-years%27-event
8. https://www.civildefence.govt.nz/resources/news-and-events/news/update-on-regions-affected-by-flooding/

Figure 1. The natural flow of the Hutt River has been constrained by urban development. Still from video by Greater Wellington Regional Council.

Figure 2. Upgrading flood protection infrastructure, Tūtaekuri River, Hawke's Bay. By Caroline Wood.

While this might work for 'smaller' floods, in other cases (including those mentioned above) these hard-engineered solutions have actually increased the risk of flooding to our communities. Sure - embankments keep water out of our communities most of the time. But that's provided a false sense of security: given us the idea that we can develop our communities right up to the edges of stopbanks. When the floodwaters start to rise, those embankments just increase the depth of water in the river, and when that river eventually overtops or breaches the banks, the floodwaters are much higher and have much more energy than they otherwise would. The consequences can be catastrophic and fatal – doing more harm to people and communities than would have occurred if we had never the been there is the first place. It's what we're seeing over and over and over again across Aotearoa.

Increasing the risk of catastrophic flood damage hasn't been the only consequence of this river 'management'. Rivers themselves have suffered drastically. Habitat for native fish, birds, and insects has been destroyed; wetlands have disappeared; and rivers have been disconnected from their floodplains and the aquifers beneath them. Then there's the impacts on the cultural, social, and economic wellbeing of our communities – the natural environments we identify with have been severely degraded, swimming holes have been destroyed, and the ongoing cost of maintaining 'flood protection infrastructure' and cleaning up after floods has been (and continues to be) enormous.

As the climate continues to change, we're going to experience more intense rain across Aotearoa, more often. That means we're going to see higher river flows and more flooding than ever before. Most of the 'flood protection infrastructure' in our communities was designed to cope with the sorts of river flows we've seen in the past (and even then, it has struggled to cope), so we need to think carefully about whether it is really going to 'protect' us when we're hit by the next record-breaking storm and the unprecedented river flows that follow. While building bigger stopbanks might be an acceptable option in some places, elsewhere this could potentially just further increase the risk our communities face if those stopbanks are ever breached.

Internationally, there is a move away from 'engineering' rivers. Instead, communities are 'making room for rivers' to give them space to flood safely and to allow natural habitats to come back.

In the 1990s the Netherlands experienced unprecedented floods that overwhelmed flood protection infrastructure and triggered the evacuation of hundreds of thousands of people (along with a million livestock).[9] With the intensity and frequency of flooding increasing, government officials decided that continuing to raise stopbanks was no longer an option. Instead, they started the nature-based 'Room for the River' program to restore rivers' natural flood plains in strategic places, allowing space for rivers to flood safely. A recent study of the Rhine and Meuse rivers, two rivers in the program, found that simply making enough room to lower river levels by 30 cm during floods could reduce the probability of stopbank failure by 2-5 times. Lowering levels by 50 cm could reduce the probability of failure by more than 10 times. It's a nature-based solution that has placed the Netherlands well ahead of other nations in adapting to the impacts of climate change.

Making room for rivers in the Netherlands has had other significant benefits. It has improved communities' quality of life: allowing more space for wildlife and recreation reserves, promoting housing developments in safer spaces, and better protecting heritage villages, sand dunes, and beaches – all of which are important to local tourism.[10] It has also been much more cost effective than constantly repairing flood protection infrastructure (or rebuilding roads, bridges, and towns) after large floods.

[9] *https://www.eea.europa.eu/signals/signals-2018-content-list/articles/interview-2014-the-dutch-make*

Figure 3. Room for the Waal River, in the Netherlands. © Courtesy of Royal HaskoningDHV.

We've been slow to adopt the 'room for rivers' approach in Aotearoa. Government and most councils are still investing in heightening stopbanks and 'engineering' riverbeds. However, things might be starting to change. There have been calls from scientists to "release [our] strangled rivers", with them noting "we shouldn't be surprised when our rivers break their banks [because] that's just a river being a river". This call has grown, to the extent the 'NZ Rivers Group' will focus its entire conference this year on 'Making Room for Rivers' – an attempt to normalise the idea while helping decision-makers understand just how it can be done. Making room for rivers has even made its way into the lexicon of a few councils, including Horizons, Tasman, and Wellington, who are (slowly) starting to move.

But if 'making room for rivers' is ever going to become the norm, we need everyone to appreciate its value. And that will take all of us who understand doing everything we can to help people and communities along. That's why, as part of our campaign on climate change, Forest & Bird is promoting the idea. We'll be doing what we can to show people their communities are safer and their rivers are healthier when rivers are given room to move. We'll be calling on the government and councils to adopt a modern approach to river management, and we're excited to be joining others – like the NZ Rivers Group – who have already started making those calls.

By making room for rivers we can protect our communities from the impacts of climate change – while protecting the health and mana of our rivers. It's a win-win mitigation strategy, and one that Forest & Bird looks forward to progressing alongside the NZ Rivers Group, research institutions, local and regional councils, government, and communities.

[10] *https://www.eea.europa.eu/signals/signals-2018-content-list/articles/interview-2014-the-dutch-make*

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Forest & Bird website: https://www.forestandbird.org.nz/

ARTICLE:
GETTING TO THE CORE OF THE PROBLEM: UNLOCKING FLOOD HISTORIES

Introducing new PhD student, Immy Doyle

Immy Doyle has recently started a PhD at Massey University, funded by Manaaki Whenua Landcare Research's MBIE Endeavour Programme on the Smarter Targeting of Erosion Control (STEC). In this PhD Immy is using floodplain coring to unlock sediment archives in the Whanganui, Manawatu and Oreti catchments. The understanding of flood magnitudes is limited by the short history and poor spatial density of instrumental records – gauged records don't generally extend much further back than the 1950s at best. Floodplain sediments and stratigraphy provide a record of past river activity and flooding that can extend this record of flooding over millennia, helping contextualise modern sedimentation rates, flood magnitudes and frequencies. The grain size of deposited sediments relates to the energy of the flow in which they were deposited and their chemical signature reflects sediment source locations (Figure 1).

The project is building on pilot studies published in 2018 and 2019 in the Manawatu and Whanganui catchments respectively by two of the supervisory team, Prof. Ian Fuller and Prof. Mark Macklin (see references Fuller et al. 2018; 2019). These studies extended flood histories of the Manawatu over 3000 years and Whanganui over 2000 years and showed that the largest floods in both catchments exceed any event in the gauged record. Immy's prior work at University of Otago, working in lacustrine environments, has developed a skillset understanding the processes governing sediment accumulation and deposition in that environment and experience interpreting climate records from sedimentary archives provides a good foundation for her work within the STEC programme.

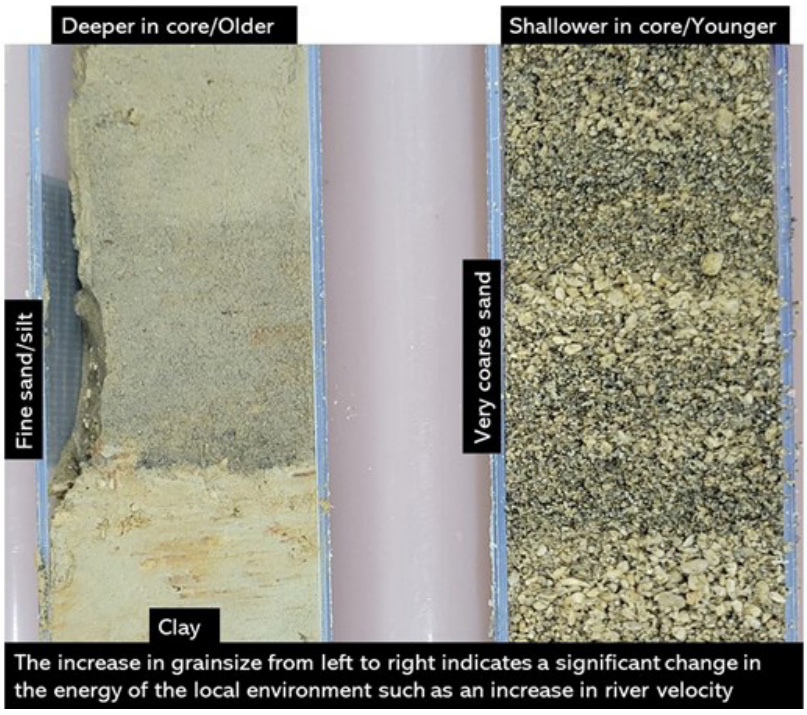

Figure 1: Changes in stratigraphy, like those seen here can provide insight into the frequency and magnitude of past flood events. (core from Atene bend, Whanganui river)

Coring of the Whanganui river at the Atene valley cutoff was completed in 2020 (prior to Immy's involvement) with approximately 36 m of core collected. On her first day on the project in early 2022, Immy cored the Oreti River floodplain with her supervisors Dr. Sam McColl and Prof. Ian Fuller, extracting approximately 25 m of core across 8 coring sites (Figure 2 and Figure 3). Coring of the Manawatu is expected to take place in summer 2022/23.

Cores are being analysed at the University of Otago under the guidance of co-supervisor Prof. Sean Fitzsimons, utilising Geotek and ITRAX X-Ray Fluorescence (XRF) core scanners to collect high resolution core images, magnetic susceptibility data and information on the elemental composition of core materials (Figure 4). CT scanning of cores is also being undertaken at Invermay, providing high resolution information on core density. These non-destructive datasets will be used in conjunction with laser diffraction particle size analysis, radiocarbon dating and ICPMS analysis to reconstruct and develop the erosion and flood histories of the target catchments.

Figure 2: Imogen Doyle and Ian Fuller coring a former channel of the Oreti River, February 2022

Figure 3: ~25 m of core collected from the Oreti River, February 2022

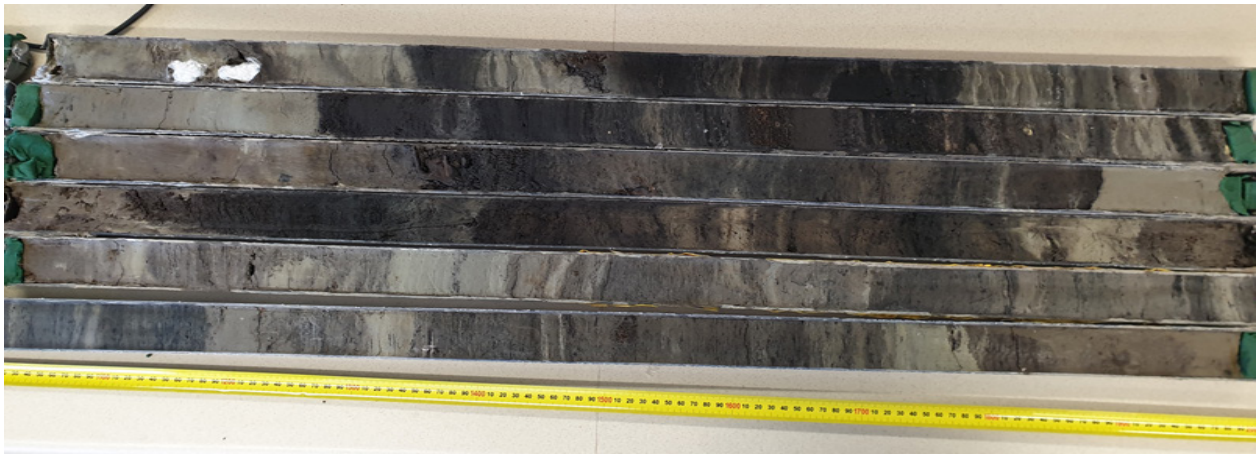

Figure 4: It's complicated: ITRAX XRF, CT, radiocarbon and particle size analysis data will be used to pull apart the complex stratigraphy seen here. (Cores from Atene Bend, Whanganui river)

References:

Fuller, I.C., Macklin, M.G., Toonen, W.H. and Holt, K.A., 2018. Storm-generated Holocene and historical floods in the Manawatu River, New Zealand. Geomorphology, 310, pp.102-124.

Fuller, I.C., Macklin, M.G., Toonen, W.H., Turner, J. and Norton, K., 2019. A 2000 year record of palaeofloods in a volcanically-reset catchment: Whanganui River, New Zealand. Global and Planetary Change, 181, p.102981.

RIVER PRACTITIONERS WORKSHOP: RIVER PROCESSES AND SOLUTIONS FOR RIVER MANAGEMENT

New Zealand river managers and engineers are tasked with working in some of the most dynamic river systems in the world. Sudden and rapid changes in these channels can render control and modification structures redundant, threaten their integrity, or undo months of river control work.

In this workshop we will introduce the key processes driving river behaviour in New Zealand. Our premise is that understanding these processes is key to working with them, rather than against them. In turn, working with the dynamics of the river is critical for effective and sustainable river management, to reduce the risks of failure and loss of infrastructure and capital, and even improve the aesthetics and habitat of managed river reaches.

We invite participants to discuss particular issues and sites that they may be working with currently or expect to engage with in the future, to connect our theory with your practice. Problem-cases in particular are welcome to discuss in BYO case study sessions. A full afternoon will be devoted to these discussions and sharing of practice, problems and solutions – the floor will be yours.

The workshop is facilitated by Professors Ian Fuller & Russell Death, Innovative River Solutions Group, School of Agriculture & Environment.

Details:

Dates: September 6-7 2022

Venue: Massey University Campus, Palmerston North

Cost: $1250.00 (Covering lunches, morning & afternoon teas, tuition, resources and attendance certificate)

Registration: Closes 23 August or when capacity of 30 participants are all filled.

Programme: See below

REGISTER NOW

RIVER PRACTITIONERS WORKSHOP: PROGRAMME

Day 1:

8.30 – 9.00 Registration: AgHort Building Foyer (Riddet Road)

9.00 – 10.30 Session 1: Catchment context & connections

10.30 – 11.00 Morning Tea

11.00 – 12.30 Session 2: River channel forms

12.30 – 1.30 Lunch

1.30 – 3.00 Session 3: River channel changes and trajectories

3.00 – 3.30 Afternoon Tea

3.30 – 5.00 Session 4: River histories and futures

Dinner: at own expense, but we may book a table at Brew Union if there's interest (please express any interest in this once registered to i.c.fuller@massey.ac.nz and confirm at registration on Day 1)

Day 2:

8.30 – 10.00 Session 5: Working with the river

10.00 – 10.30 Morning Tea

10.30 – 12.00 Session 6: River ecology

12.00 – 1.00 Lunch

1.00 – 3.00 Practices, problems, solutions: case study discussion & workshopping*

3.00 – 3.30 Afternoon Tea

3.30 – 4.30 Case studies continued* & concluding discussion

All sessions in AHB 3.02c (top floor, Ag Hort B Building)

*This afternoon session is intended to bring practitioners together to discuss issues and problems as well as opportunities, approaches and solutions to any aspect of river management. Participants are invited to prepare a slide or slides to share, or you can take us to your river in Google Earth. The idea is to share collective expertise and seek to apply understanding developed in the preceding sessions. All enquiries to i.c.fuller@massey.ac.nz please.

GENERAL INFORMATION

Call for contributions

For our newsletter FLOW we are always looking for articles from our membership. Please consider submitting an article, case study, update or notice for the next issue of FLOW.

The upcoming submission deadlines for 2022 are as follows:

Issue	#	Deadline for contributions
September 2022 issue	#37	Monday, 15 August 2022
December 2022 issue	#38	Monday, 14 November 2022

Please format your contribution as follows:

- Length of around 500 – 1,500 words, preferably in Microsoft Word format (Articles should include: title, name of the author(s), affiliation(s), and section headings; illustrations and/or tables are strongly encouraged)
- If possible, attach images in jpg (file size 300KB-1MB) and at high-resolution separately
- Provide credits and captions for your images

If you have articles which are longer, please email us and we will work out a way forward together with you.

Please email rivers.group@engineeringnz.org to submit your FLOW contributions or any news you want to share. We look forward to receiving your contribution.

Rivers Group Manatiaki Kōawa Mission Statement

The New Zealand Rivers Group Manatiaki Kōawa was formed in 2009 to provide a forum for 'Working together to promote good river management'. It is a place for people with an interest in rivers, flood risk management and the operational and environmental issues of catchments and river systems to come together.

We currently have over 300 members, and promote a multi-disciplinary approach to river management, reflecting cultural and societal diversity in an integrated and holistic manner. Our membership reflects this, with our members coming from a wide range of river management, science and engineering, and planning backgrounds - working as consultants, or in local, regional and central government, research institutes and universities.

New members can sign up here https://riversgroup.org.nz/joining-the-rivers-group/.

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