flow

manatiaki kōawa
rivers
GROUP

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

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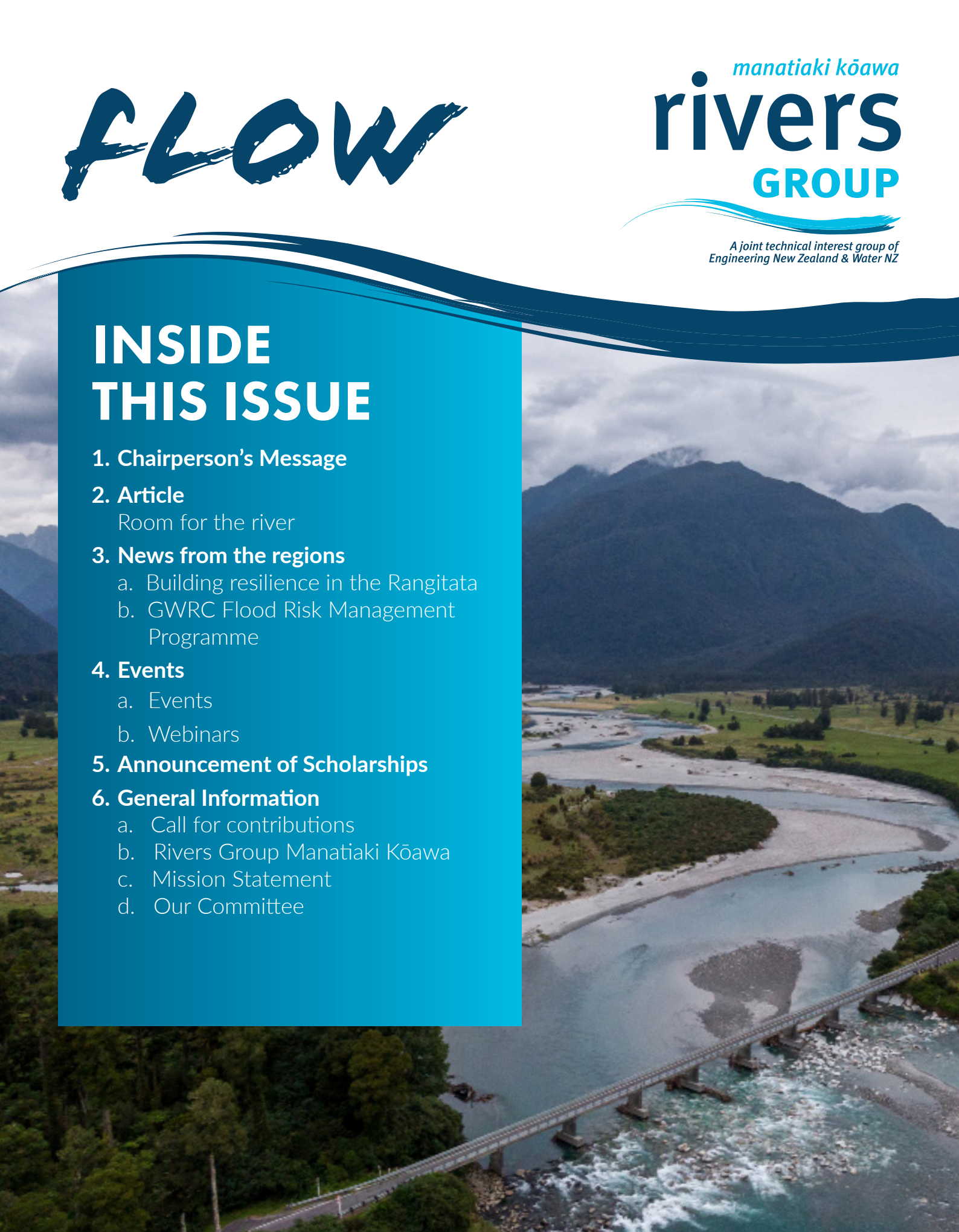


NEWSLETTER

Issue 33 | June 2021

FROM THE CHAIR

Heide Friedrich

It is a busy time for many of us, delivering on shovel-ready projects and providing information for the various reviews/consultations that take place and will take place in Aotearoa now and in future. We do have the repeal of the Resource Management Act 1991, which the government plans to replace with three new pieces of legislation. He Pou a Rangi, the Climate Change Commission, published their first package of advice earlier this year, with a consultation window from 1 February to 28 March 2021, with the finalised advice expected to be given to Government by 31 May 2021. The Water Services Bill work is advancing, with its major work to implement the Government's decision to comprehensively reform the drinking water regulatory system, together with the regulation and performance of wastewater and stormwater networks. The new water services regulator Taumata Arowai is set up, set to become the dedicated water services regulator at the conclusion of the Water Services Bill. Te Waihanga, the New Zealand Infrastructure Commission, is developing a 30-year Infrastructure Strategy, with consultation open until 24 June 2021. On top of it, an independent review of local government is taking place to explore how councils can maintain and improve the wellbeing of New Zealanders in the communities they serve.

With so many reviews and consultations happening at the moment, it is important to note that at the heart of all of them is water. We have a choice, treating water as a resource and asset, or first and foremost treating is as taonga, which is a resource and asset in itself, and thus valuing the need for protecting qualities and quantities of freshwater. It is part of the traditional Māori world view to envision our rivers as sentient beings. This is well illustrated by the Māori saying that rivers are the veins of Papatūānuku, Earth Mother, and the water in them is her lifeblood. Pressures on riverine environments are increasing, not only when it comes to freshwater quality, but also to the space provided to river networks.

I encourage all our members to engage with the various reviews, and share their views on truly sustainable practices that can be implemented to ensure the wellbeing of Aotearoa's future generations and ensures kaitiakitanga.

A reminder herewith that our 2021 Annual Conference is dedicated to the Room for the River. The conference will be held 17-19 November 2021 in the Lower Hutt events centre, and we aim to focus on the barriers of implementing Room for the River in Aotearoa, and welcome any of you to get in touch with us, if you want to be involved in shaping the conference.

As always, thank you again to the people who sent us their articles to be published in this newsletter. We are always looking for contributions or articles you want to share, please email rivers.group@engineeringnz.org to submit your FLOW articles or any news, and keep checking for updates and connect with us through our Website, Facebook, Twitter and LinkedIn.

I hope you have time to take a break during this busy stretch for many of us, and enjoy our rivers with family and friends.

Heide Friedrich
Chair

ROOM FOR THE RIVER

WHY WE SHOULD RELEASE NEW ZEALAND'S STRANGLED RIVERS TO LESSEN THE IMPACT OF FUTURE FLOODS

by Gary John Brierley (University of Auckland), Dan Hikuroa (University of Auckland), Heide Friedrich (University of Auckland), Ian Fuller (Massey University), James Brasington (University of Canterbury), Jo Hoyle (National Institute of Water and Atmospheric Research), Jon Tunnicliffe (University of Auckland), Kristiann Allen (University of Auckland) and Richard Measures (National Institute of Water and Atmospheric Research)

When two West Coast rivers flooded on the same day in 2019, the Waiho tore down a bridge and cut off local communities for 18 days, and the Fox eroded a landfill, exposing 135 tonnes of rubbish that contaminated beaches more than 100km away.

A flood on the Rangitata River during the same year severed road, rail and power connections along the east coast of the South Island and cut a 25km path to the sea through prime dairy country.

We shouldn't be surprised when our rivers break their banks — that's just a river being a river. Current management practices in Aotearoa treat rivers as static, in the hope of making them more predictable.

But this can lead to disasters.

The recently announced reform of the Resource Management Act (RMA) is an opportunity to address river confinement, but it isn't enough. We need to change the way we think about rivers.

By forcing rivers into confined channels, we are strangling the life out of them and creating "zombie rivers".

Unless we change management practices to work with a river, giving it space to move and allowing channels to adjust, we will continue to put people and rivers on a collision course.

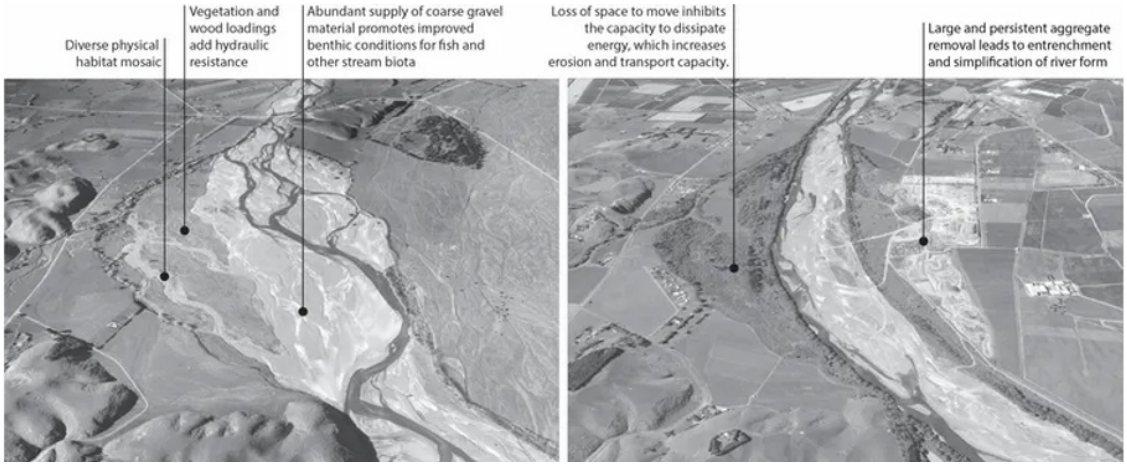
When flood risk is managed poorly, disadvantaged groups of the population are often disproportionately impacted. Given climate change predictions of more extreme floods and drought, the problem will only get worse.

Working with a river, not against it

A healthy river is resilient, constantly adjusting its path and regenerating habitats, with significant capacity to self-heal and recover from disturbance.

Although New Zealanders associate with the ecological and cultural values of living rivers, such as ancestral connections and places of food gathering (mahingai kai), our management practices continue to treat rivers as unchanging. This reflects a colonial approach that tries to confine rivers within defined corridors to maximise the availability of land and manage flood risk. River confinement in New Zealand is the result of both engineering works such as stop banks, intentionally focused on flood defence, and the slow creep of agricultural encroachment. Current river management practices are funded by targeted rates paid by landowners. Their goal is to protect as much land as possible as cheaply as possible.

This has arguably been very effective to date and is understandable, but ignores other river values. It also misses the point that when design limits are exceeded, disaster usually follows.



Photogrammetric and satellite images from identical positions show how a section of the Ngaruroro River, in the Hawkes Bay, changed between 1950 (left) and 2020 (right). NZ Aerial Photography (via Retrolens), SN541 (1950) and Google Earth/Digital Globe (2000).

Effective river management

There are always trade-offs. For example, planting introduced willows along river banks is a cost-effective way of trying to control the river in the short term. But willows spread aggressively and choke the river, diminishing habitat diversity and reducing the river's capacity to transport flood waters and gravel. This exacerbates risk in the medium to long term.

In scientific terms, effective approaches to river management look after the geomorphology of river systems — the interactions that shape the changing mosaic of river habitats — alongside concerns for water quality and aquatic ecology. This requires analysis of flows and sediment deposition to assess how a river uses its energy.

When a river has space to move, it dissipates its energy. This builds its capacity to recover from disturbances and maintain a dynamic but stable state. Constraining a river's flow into a restricted space concentrates flow energy, increases flood magnitude and accentuates problems downstream.

Rather than forcing a river into a defined place (which also often limits people's access to it), more responsive and low-impact practices would embrace a harmonious relationship with dynamic, living and adjusting rivers.

Reframing environmental law

Just as landowners often perceive wetlands as potential farm land once drained, planted river margins are sometimes considered "wasted" land. Agricultural encroachment removed more than 11,000 hectares of braided river bed on the Canterbury Plains between 1990 and 2012.

The current wording of the Resource Management Act (RMA) allows this, as its definition of river bed assumes a static river channel. This is clearly inappropriate for braided rivers, which have multiple shifting channels.

That said, we are cautiously optimistic about reframing the RMA to promote more judicious choices of land for development.

Changing flows of the braided Waimakariri river between 1942 and 2020.

Reducing the impacts of future disaster

International studies show that allowing a river to self-adjust is cheaper and more effective than active interventions that force a river into a particular place.

Europe and Japan have a long history of confining rivers. Once management practices start on this path, they become locked into progressively building more and more expensive hard engineering structures. Many rivers in Aotearoa New Zealand are less modified than those in other parts of the world. Changing management practices now can have a significant positive effect.

Contemporary scientifically-informed approaches to river management directly align with te ao Māori, wherein practices respect ancestral connections, living with rivers rather than seeking to control them. This presents an opportunity for regenerative relations to living rivers, recognising and enhancing their mana so they can function unimpeded.

Although rivers in Aotearoa are well described and we have some of the best databases and monitoring practices, this does not mean we are giving effect to the principle of Te Mana o te Wai, which aims to respect the natural need of a river to adjust as a living entity.

Working with the processes that create and rework a river channel and its floodplain will reduce the impacts of future disasters. Recognising the links between sections of a river and the whole catchment will help us assess how likely it is that the river will adjust to accommodate larger and more frequent future floods.

An honest discussion now could save us the direct and indirect costs of future clean-up and repair. Reanimating rivers seeks to respect the rights of healthy, living rivers that erode and flood in the right place and at the right rate.

BUILDING RESILIENCE IN THE RANGITATA - FLOOD RECOVERY WORKS UNDERWAY

by Environment Canterbury

An extreme weather event

The flooding experienced along the Rangitata River in December 2019 was the culmination of an extreme weather event that saw a combination of intense rainfall, and flows that were both high and sustained over time across the West Coast and Canterbury.

In the Rangitata catchment there were six days of heavy rain and three high river flows that peaked at 2307 m^3 - this is about 35 times more flow than usual. During the third high flow Environment Canterbury recorded more than 2000 cumecs for an incredible 10 hours.

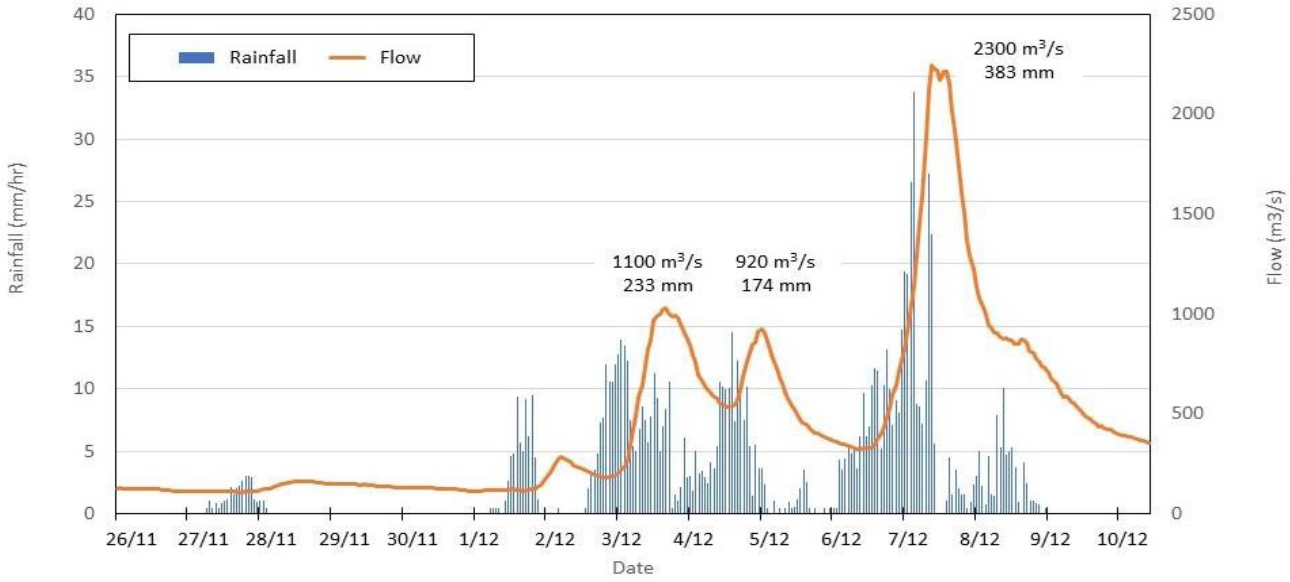


Figure 1- Rangitata at Klondyke flow (orange) with Mistake Flat rainfall (blue)

Environment Canterbury's most recent Flood Frequency Analysis (Steel & Martin, 2020, currently in draft) estimates a return period of 14 years, for a flow of 2,300 m3/s.

ARI	Mean annual flood	5 year	10 year	20 year	50 year	100 year	200 year	500 year	1000 year
Flow (m^3/s)	1,230	1,740	2,150	2,550	3,060	3,440	3,820	4,320	4,710

Table 1 - Flood frequency – Rangitata River at Klondyke Recorder Station

This extremely intense volume of flow caused severe erosion of the southern banks of the Rangitata River. Large areas of trees planted for erosion-control were lost and there were major losses to roading, rail, electricity supply and other assets. Flood flows broke out of the river and flowed down the south branch for the first time in 24 years causing damage to farmlands and equipment.

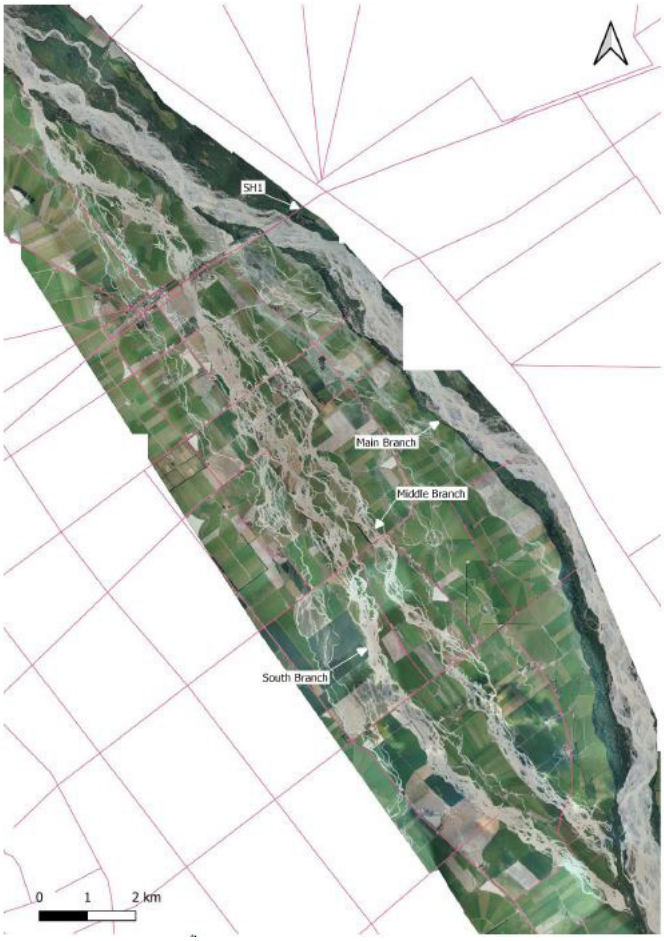


Figure 2 - Aerial Imagery 9th December 2019

Following the flood, Environment Canterbury's priority was to stop the outflow of floodwaters from the river onto the adjacent floodplain and over key roads. Emergency works were undertaken to retain ongoing and future flood flows within the main channel. This involved the use of bulldozers to construct three temporary gravel bunds, one across each of the three breakout points, and other river works to divert active braids away from the breakout locations.

Flood resilience works underway

Now, works are starting which will provide protection against future flood events.

Flood resilience will be achieved through extension of emergency embankments erected immediately following the flooding, construction of new stopbanks and gravel groynes, and strengthening of rock stub groynes at five sites along the south bank of the Rangitata River.

At a construction cost of about $1.3 million, the works are 64 per cent funded by the central government's Climate Resilience Programme of Flood Risk Management Projects (initiated as part of the COVID-19 recovery response) which is administered by the Provincial Development Unit (PDU) of the Ministry of Business, Innovation and Employment (MBIE) in a co-funding arrangement.

The remaining 36 per cent of the cost will be co-funded by the Rangitata River Rating District (Environment Canterbury), Waka Kotahi NZTA, Rangitata South Irrigation Limited, Kiwirail, Timaru District Council, Ashburton District Council and Transpower.

An ambitious programme for the Rangitata Awa

Whilst these physical works address the immediate flood risk to the Rangitata community from damage following the 2019/2020 flooding, they are a small part of a larger ambitious programme supported by climate resilience funding from the PDU which will see up to $24.2 million spent across the entire Canterbury region over three years.

In addition to facilitating urgent repairs and supporting local employment, this funding offers a wider opportunity to accelerate regeneration of the natural environment and partner with mana whenua and other stakeholder groups to lead the way for climate resilience in the Rangitata.

A shared vision

Environment Canterbury has joined the Rangitata Restoration Initiative to support the Te Rūnanga o Arowhenua vision for the Rangitata Awa. This is an exciting project connecting Te Rūnanga o Arowhenua, multiple government agencies and the community.

Te Rūnanga o Arowhenua, the Department of Conservation, Environment Canterbury, Land Information New Zealand, Central South Island Fish & Game, Timaru District Council and Ashburton District Council have come together in a collaborative forum based on a shared vision and values to protect and restore the mauri/life force of the Rangitata Awa, ki uta ki tai/ from source to sea.

Together we are prioritising the health and wellbeing of the Rangitata Awa now and for generations to come.

Figure 3 - Looking north across the State Highway 1 road bridge and Railway bridge (7 Dec 2019)

Figure 4 - Looking south east downstream of the irrigation ponds

GREATER WELLINGTON REGIONAL COUNCIL FLOOD RISK MANAGEMENT PROGRAMME

What we are doing?

Greater Wellington (GWRC) is responsible for managing flood risk from the region's major rivers. Many of our region's major community are at risk including the Hutt Valley, Waikanae, Otaki and the key Wairarapa towns. Flood risk is currently managed by GWRC, Territorial Authorities, and the Wellington CDEM group (WREMO). GWRC's Flood Protection Department currently use four main risk management techniques;

- Planning Controls – Elimination of flood risk by preventing development in flood prone areas. Reduction of risk through development advice. Delivered by Flood Protection Department.
- River Management – Reduction of risk through channel maintenance. Delivered by Flood Protection Operations team.
- Engineering controls – reduction of risk through the construction of engineering flood defences such as stop banks or through allowing the river more room. Delivered by Flood protections Implementation team.
- Emergency Management – Reducing the risk, particularly the residual risk through emergency readiness, response, and recovery procedures. Delivered by a combination of Flood Protection, WREMO, and Hydrology.

Through recent studies GWRC found that communities at risk had low levels of awareness of flood hazard, flood forecasting and warning systems could be improved and existing flood response procedures could be improved and aligned with the national civil defence response incident management systems.

The Flood Risk Management Programme is addressing these key issues with three core project workstreams:

- The Flood Response Project provide new Response procedures aligned with the Coordinated Incident Management System (CIMS), the national framework for incident response as well as a programme for building organizational capability.
- The Flood Warning Project provides a programme of work to enable reliable flood forecasts and warnings delivered to stakeholders with improved lead times, and has incorporated a formal market sounding to seek international best practice solutions.
- The Flood Awareness Project seeks to design a community engagement campaign to raise flood risk awareness particularly communities with low levels of hazard awareness to improve the publics ability to respond to warnings and recover from flooding. In developing the program, collaborating closely with Civil Defence community resilience specialists.

Where are we now?

Greater Wellington has engaged Tonkin + Taylor to collaborate with the Council team and deliver the first stage of these projects joined by specialist Flood Risk Management Consultancy RAB, and web development firm, Translate Digital.

We have developed a regional flood response framework and associated procedures that aligns with CIMS through a collaborative process with the region's civil defence experts to build relationships and understanding that will service us in good stead during an event.

Through a global market search we have identified a flood forecasting platform widely used in the Netherlands and elsewhere which will allow us to operationalise our existing forecasting capability and as we develop further catchment forecasting models allow them to be plugged in.

We have worked with civil defence to develop a series of key messages for use before, during and after a flood. We recognise that multiple agencies are involved in public messaging during a flood event and we're working to share the agreed key messages with our partners in the Region.

As the programme progressed we recognised that the physical flow gauging infrastructure also required a review and upgrade to ensure we had the coverage we require and robust, resilient instrumentation. To address this we added a strategic review of the gauging network and are now in the process of developing a multi-year implementation programme.

What we're doing next?

Over the coming year the focus is training and testing our Duty Officers in the new procedures and transitioning to them. We're exploring options for a regional multi-agency exercise to continue the building of connections, understanding and preparedness. We'll be working with our internal ICT team to procure and develop the flood forecasting platform and exploring the roles and responsibilities around public flood warnings to the wider public.

EVENTS

River Practitioners Workshop

Next month Massey University in Palmerston North will be hosting its annual (though interrupted in 2020) River Practitioners Workshop. 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. New Zealand practitioners must be sensitive to the key processes driving river behaviour in New Zealand, and Professors Ian Fuller & Russell Death will teach that understanding these processes and working with them is the key to success.

Date: 15 – 16 June 2021

Venue: Massey University campus, Palmerston North

Tutors: Professors Ian Fuller & Russell Death, Innovative River Solutions Group, School of Agriculture & Environment.

Cost: $1250, covering lunches, morning & afternoon teas, tuition, resources, attendance certificate

Registration: www.massey.ac.nz/river-practitioners
Enquiries to Prof. Ian Fuller: i.c.fuller@massey.ac.nz

Registration to close: 7 June 2021, or when limit of 30 participants reached.

Picture a Scientist

The Rivers Group was proud to support a screening of Picture a Scientist held in Tauranaga in March. Deputy Rivers Group Chair, Selene Conn did a wonderful job pulling leading this event. She assembled a panel of leading local scientists with discussion focusing on positive action for increasing diversity in STEM, and in particular STEM leadership. Picture a Scientist is a feature-length documentary film chronicling the groundswell of researchers who are writing a new chapter for women scientists. A biologist, a chemist and a geologist lead viewers on a journey deep into their own experiences in the sciences, overcoming institutional discrimination, and years of subtle slights to revolutionize the culture of science.

We encourage others to link in with their local Engineering New Zealand branch if you'd like to organise a similar event.

This year's conference theme is Making Room for Rivers. With climate change predicted to bring more extreme floods and changing community values, there is pressure on river managers to look for alternative methods when providing more integrated catchment management. One such aspect is making room for rivers. Our conference this year will explore how to make this concept a reality through a series of invited speakers over 2 days to discuss examples from around the globe, as well as right here in our own backyard. There will also be a chance for you to share your stories through a poster session and an opportunity to get out in the field to see how it might work in the Greater Wellington region.

Check out https://www.riversconference2021.co.nz/ for more information.

Early bird registrations open 25 May 2021.

Want to share your stories or work on Making Room for Rivers?

We would like to invite those working on the topic to present posters at this year's NZ River's Group conference. We are looking for work that covers a wide variety of topics linked to the concept of giving rivers room, not just engineering or geomorphology.

Topics could include but not limited to;

- Geomorphology & Ecology
- Mātauranga Māori
- Policy and planning
- Landowners
- Engineering
- Implementation
- Community Engagement

If you are interested in sharing your work we would love for you to submit a 200 word abstract on your topic through via the website by 23 August 2021.

ANNOUNCEMENT OF SCHOLARSHIPS

Student research scholarships

The NZ Rivers Group is funding up to three $1,000 student research scholarships to support postgraduate researchers working on issues related to rivers, flood risk management and the operational and environmental issues of catchments and river systems. Applications are invited from students pursuing postgraduate research focused on New Zealand's rivers and catchments, including cultural health, water quality, water quantity, flood management, energy generation and environment protection, as well as promoting a multi-disciplinary approach for river management, that reflects cultural and societal diversity in an integrated and holistic manner.

Full details and application form are available at https://riversgroup.org.nz/funding-opportunities/. The closing date for applications is 9 July 2021.

Arch Campbell award nominations

The Arch Campbell award is the highest honour for contributions to river management in NZ. The award was established in memory of Arch Campbell to recognise his very significant contribution to soil conservation and river control and management in New Zealand and has been presented annually since 1994. Nominations are requested for individuals who have either:

- made a notable contribution over a number of years to the advancement of knowledge or practice relating to catchment hydrology, river and stream hydraulics, sediment transport or catchment or river management; or
- have published a notable paper, presentation or written report regarding catchment hydrology, river and stream hydraulics, sediment transport or catchment or river management.

Further details regarding the award, past winners, and a nomination form are available at https://riversgroup.org.nz/arch-campbell-award/. The closing date for applications is 30 September 2021.

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.

Issue	#	Deadline for contributions
September 2021 issue	#34	Monday, 16 August 2021
December 2021 issue	#35	Monday, 15 November 2021

Please format your contribution as follows:

- Length of 500 – 1500 words, in Microsoft word format (Articles should include name of the author(s), affiliation, titles and section headings and illustrations are strongly encouraged)
- 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.

Please email rivers.group@engineeringnz.org to submit your FLOW contributions. 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 250 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 riversgroup.org.nz/joining-the-rivers-group/.

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