Flow

rivers GROUP

A joint technical interest group of IPENZ & Water NZ

Rivers Group Newsletter
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ReesScan – HYPERSCALE MODELLING OF THE REES RIVER

Richard Williams, Research Associate, Institute of Geography and Earth Sciences, University of Wales Aberystwyth

Sediment transport through braided rivers is intermittent, highly unsteady and spatially variable. This challenges the ability of river managers and scientists to predict future patterns and timescales of channel adjustment in braided rivers. In many cases there is a dearth of data to answer pertinent questions associated with managing river catchment sediment budgets. For example, it is difficult to assess how floodwater-harvesting, due to the presence of upstream reservoirs, will impact upon the evolution of channel pattern, floodplain vegetation and instream habitats.

Rees River discharging sediment to Lake Wakatipu

A team of rivers scientists from Aberystwyth University, UK, working in partnership with NIWA, have recently begun an eight-month field campaign in the Rees River catchment to gather information on sediment budgets and morphological transport rates through a three-kilometre long braided reach. The field monitoring is intended to collect data before and after each high-flow event between September 2009 and May 2010. It is hoped that the research will provide insight into the controls on reach-scale and local bed mobility.

Study reach of the Rees River

The scientists are exploiting a range of cutting-edge technologies to monitor the river in unprecedented detail. These include, ground-based laser scanning to collect approximately one billion ground level survey points per day. This is coupled with bathymetry data from GPS located echosounders and river depth mapped from aerial photography. Ultimately these data will enable detailed models of channel change to be constructed. Flows are also being monitored upstream and downstream of the study reach using state-of-the-art side-looking and mobile Acoustic Doppler Current Profilers (ADCP's) and downward looking radar level gauges. Finally, sediment transport is measured during floods by tagging tracer pebbles with radio chips and measuring the velocity of the river bed from acoustic soundings.

Ground-based laser scanning of the Rees River

As the project progresses information is regularly being posted to the project website, www.reesscan.org If you have any questions or comments then please get in touch with the research team, either by contacting Richard Williams, rvw@aber.ac.uk, who will be based in New Zealand until May 2010, or the project leader James Brasington, jtb@aber.ac.uk, who will be based in New Zealand until January 2010. ≈

WAIMAKARIRI FLOOD PROTECTION PROJECT

Ian Heslop, Project Leader, Environment Canterbury

Environment Canterbury has obtained the green light to proceed with the Waimakariri Flood Protection Project. This project consists of a new secondary stopbank along the Waimakariri River south side to protect Selwyn District and Christchurch City, and upgrades to the existing north side stopbanks protecting Waimakariri District and Kaiapoi Township.

1957 Stopbank breach at Engelbrechts, Waimakariri River

The design flood capacity of the existing Waimakarariri stopbanks is 5,100 cumecs (estimated as a 500-year return period). At face value this standard of protection seems adequate for an urban floodplain. However the stopbank is vulnerable to breaching due to bank erosion and stopbank undermining during significantly smaller floods. A secondary stopbanking system is needed to manage the residual failure risk from floods less than, as well as greater than, the design flood.

The potential projected damage to Christchurch and Kaiapoi in an overdesign flood is estimated at $8 billion. The project is expected to all but eliminate this flood risk, and has an estimated cost of $30m, with construction planned over a 10 year period starting in 2010. The secondary stopbank has a 35 km length, with an earthworks requirement of 700,000 cubic metres, and a rock bank protection requirement of 220,000 tonnes.

Throughout the resource consenting process the hydrological, hydraulic, and engineering investigations were integrated with environmental, ecological, landscaping, and cultural assessments. Land use consents were obtained from four local authorities, as well as a dam and diversion (diversion of floodwaters) consent from Environment Canterbury. The diversion of floodwater consent required a detailed understanding of stopbank breach scenarios, diversion flows, and expected increases in flow depths over the floodplain area between the primary and secondary stopbanks.

The resource consent applications were lodged in March 2007, and hearings were held from April 2008 to May 2009. Consents were granted in July 2009 with no appeals.

Project Leader, Ian Heslop of Environment Canterbury, commented that he was very pleased with the consent decision and conditions. The main lessons the project team had learnt were the value of face-to-face consultation meetings, and the need for patience and persistence in working through the consent process. The diversion of floodwaters, and their possible effect on floodplain residents, was by far the most challenging issue. ≈

A PROPOSAL FROM THE TURNBULL GROUP

Peter Whitehouse, Manager Advocacy and Learning, Water New Zealand

Water New Zealand called together a group of water experts to take a clean slate approach to designing new arrangements to meet community needs.

Collectively named the Turnbull Group, these individuals, (not representing sectoral interests), have put their minds to the development of this proposal, *Governance of Water*.

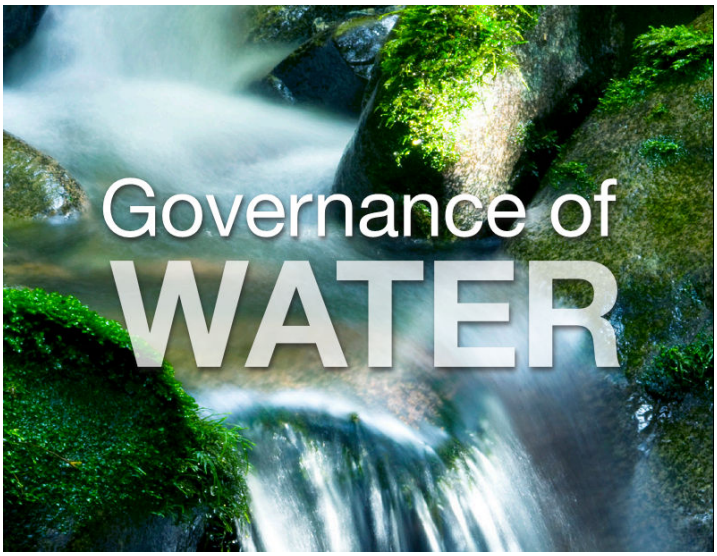
The Turnbull Group recommends an approach which is integrated, collaborative, inclusive, evidence based, and which facilitates professional management.

It allows for coordinated strategic direction, increased local community input, improved technical resourcing of decision making, and rationalisation of current arrangements for water management.

It sees the Environmental Protection Authority (EPA) as being a key to improved technical resourcing, filling the role of an effective resource manager.

The Turnbull Group approach seeks to minimise the current adversarial processes at a local level by:

- Collaborative leadership;
- Improved technical input into decision making; and
- Greater use of existing successful self-management models.



Current Regional Council decision-making with regards to water would be split, with planning going to the EPA, guided by a Water Commission, and development consents being devolved to District Councils, supported on technical matters by the EPA.

Strategic direction would be provided by the establishment of an independent Water Commission, which would provide high level collaborative leadership, and oversee the development of national water policy.

Water entities across the country would be aggregated into larger utilities serving both rural and urban communities. The Turnbull Group proposes that these operate in broadly similar areas to current regional council boundaries.

The full document, *Governance of Water*, can be found at www.waternz.org.nz/. ≈

ATTAINING THE IMPOSSIBLE: MAINTAINING BIODIVERSITY IN OUR URBAN STREAMS

Shelley McMurtrie, Aquatic Scientist, EOS Ecology - www.eosecology.co.nz

The glossy development brochures sell us the dream - meandering streams and lakes with crystal clear water and leaping fish, with your dream-home and urban necessities mere meters away. Yet the reality is far from this utopia - stormwater run-off from the large impervious areas in urban catchments flows into our streams and causes their eventual demise. This decline in stream health and biodiversity is so globally consistent it is now coined as the 'urban stream syndrome'.

With the discovery of a spring fed rural drain supporting a nationally important native freshwater crayfish (koura) and lamprey population in an area of Rangiora planned for residential development, we had to consider 'out of the box' solutions in an attempt to avoid the seemingly inevitable 'urban stream syndrome'.

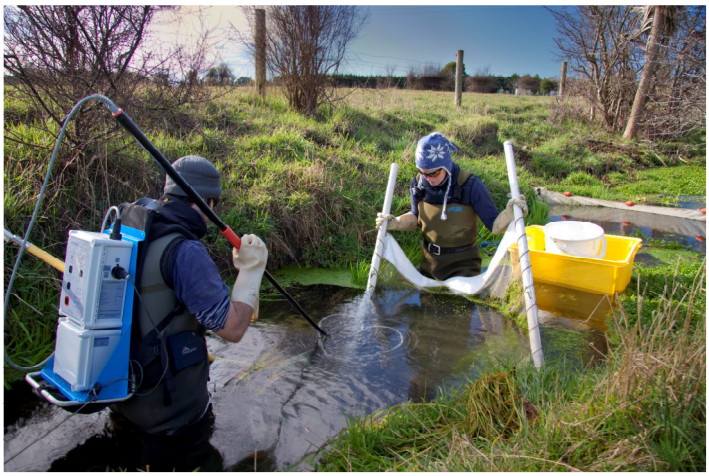
Protecting native koura was the core restoration objective

To have any hope of maintaining or even enhancing the biological integrity of this stream in the face of urban development we needed to deviate from the usual approach to the design and management of urban streams. As such, maintaining ecosystem processes had to take a more prominent role in the design and management process, rather than the more traditional approach of primarily designing for stormwater, channel stability, and landscaping amenities.

Ecosystem processes in the Rangiora spring fed stream are driven by the presence of high numbers of native koura, which through feeding and activity provide food and habitat to other animals in the system. As such the protection and enhancement of the koura population is a core requirement for maintaining this unique spring fed system.

To improve conditions for the koura, channel design for realigned sections was based on determining their optimal habitat; vertical earth banks for koura burrows, lots of in-channel woody debris for food and cover, aquatic plants in more open areas for juvenile koura habitat, and very stable flows. These features are not compatible with stormwater inputs (erosion and flooding being the eventual outcome), which cemented our decision to protect the integrity of the system by isolating it from the future stormwater network.

Biological interactions play an equally significant part in ecosystem functioning and so also require consideration in the design process. In particular, the success of a native fauna haven is dependent on protection from introduced predators; in this case brown trout. The lack of any known fish barrier that excludes trout but allows the passage of other fish species has led us to design a structure that should prevent trout from swimming up while at the same time encourage the climbing skills of the native fish found in this stream (e.g., lamprey and eels).



Electrofishing a section of the small spring fed stream in Rangiora

A design process oriented around ecology certainly does not exclude the need for engineering and hydrological considerations. Indeed, in all aspects of the design process the synergy between ecological experts and engineering is central to success, with industry engineers providing the detailed design and construction plans that realise the ecologist's biological design requirements.

Trout (juveniles pictured) are to be excluded from the stream to protect the native fauna

Protection and enhancement of this unique spring fed system in the face of urban development will be of benefit not only to this country's conservation of spring systems, but also to the future local urban community by providing residents 'on the doorstep' access to a piece of nature and iconic animals that most urban streams can no longer support. From an ecological aspect this project provides us with the opportunity to really see if maintaining a stream's ecological integrity is truly compatible with urbanisation in the long term. If we find this project successful it may well change the way we approach stormwater catchment management and may see us achieve the much lauded but rarely attained goal of maintaining biodiversity of our urban streams. ≈

Juvenile lampreys are to be protected in the future urbanised stream

WILD RIVERS CAMPAIGN

Debs Martin, Forest and Bird

Enter stage left: a finite world. Enter stage right: unrestrained growth. Result: showdown between the ecological and resource tensions in our natural world.

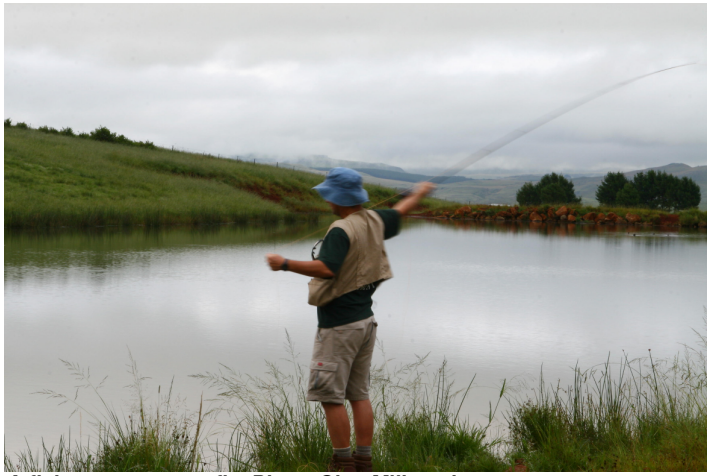
With a predicted exponential growth rate of around 1 – 2 % p.a.[1] in energy demand, and a growing awareness of the consequences of climate change resulting in a switch to renewable energy sources – its little wonder we're facing a crisis in the electricity sector.

Add into the mix a phenomenal switch to dairying in recent decades (our dairy herd now numbers more than 5 million cows) and an associated increase in demand for freshwater 'on tap' to feed this growing industry – and we're running into the same brick wall.

Across the country our wild rivers – many within public conservation land – are being targeted for storage dams or diversions for the unsustainable energy and irrigation palates in our society. In regional surveys commissioned by the Energy Efficiency and Conservation Authority (EECA), potential renewable energy options were identified. All involved the relatively cheap and well developed option of hydro generation. However, what remains are the wild rivers in New Zealand – those valued for their rich biodiversity, their remoteness, their challenge, their fish, their white-water adventures! In the Tasman district over 90% of the hydro generation options are within public conservation land or other native forests. And around the country, volunteers, non-governmental organisations and small groups are fighting to save their rivers against a tide of hydro proposals backed by wealthy corporations and expensive lawyers.

Similarly, rivers like the Hurunui – just proposed for a Water Conservation Order – are eyed as potential storage dams to feed the dry Canterbury plains to keep the grass growing and the irrigation sheds pumping. Somewhere, we have to draw a line.

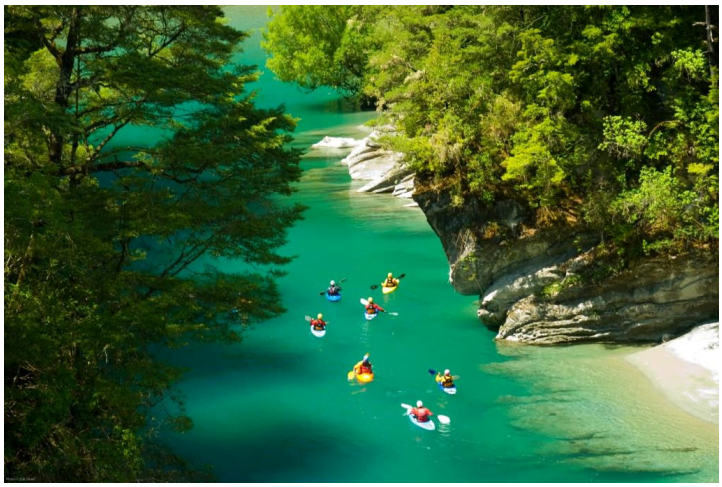
The Wild Rivers network is a group of nationally based non-governmental organisations[2] who have joined together to prompt the government, energy and irrigation sectors, into a much more sustainable vision for our future.



A fisherman casts a fly. Photo Glen Millward.

[1] This figure has fluctuated recently due to the global economic situation.

[2] Current membership of the network includes: Forest & Bird, Fish & Game, Whitewater NZ, Federated Mountain Clubs, NZ Rafting Assn, Federation of Freshwater Anglers, Council of Outdoor Recreation Assns of NZ, Environment & Conservation Orgs of NZ and Mountain Bike NZ. Regionally based groups and individuals can also be supporters of the campaign. See more info at www.wildrivers.org.nz



Middle Matakitaki – one of the most popular kayak runs in the country. Photo courtesy Zak Shaw.

Our agreed vision is:

- Wild rivers are not renewable. New Zealand's remaining wild rivers must be protected for future generations as national treasures.
- Wild rivers need the same protection as national parks.
- New Zealand's energy future does not need to sacrifice our remaining wild rivers.
- Wild rivers are free to be enjoyed by everyone.

New Zealanders are passionate about wild rivers, which are central to our national identity and international reputation

The solutions don't have to mean the death of farming, or living and freezing in the dark. They are about good governance, making wise choices, integrating our sectors, facilitating new technologies, efficiencies and conservation – and, most of all, recognising the limits of our natural resources. For more information, please visit www.wildrivers.org.nz. ≈

UPCOMING EVENTS

≈ 2010 Stormwater Conference. One of the streams at this conference will be dedicated to the Rivers Group. See http://www.waternz.org.nz/stormwaterconference.html for more detail. A number of relevant papers have been received that will contribute to stimulating interaction with your peers. In addition, the Rivers Group is planning a specific function for its members to occur during the conference. Watch our website for further detail.

≈ 17th Congress of the Asia and Pacific Division of the International Association of Hydraulic Engineering and Research incorporating the 7th International Urban Watershed Management Conference. See http://www.iahr-apd2010.com/ for detail.

≈ Members events. Several events scheduled for 2010 are being considered by the Rivers Group. These events will include training programmes in river-related topics. Rivers Group members will receive advance notice of these as well as a discount on any subscriptions. Watch our website for details: www.ipenz.org.nz/riversgroup

≈ Annual General meeting and symposium. This is planned for the second half of 2010, with venue and exact date to be confirmed in subsequent correspondence. ≈

RIVER MANAGEMENT FOR NOVICES

Craig Ambler, Drainage Project Manager, GHD Limited

How do you manage a river system when you haven't worked on one previously?

This was a dilemma I faced some years ago when I was asked by the Northland Regional Council to assist them with the management of the Awanui River scheme. Sure I had experience in a variety of roles within the civil engineering field but none specifically with rivers, so here are some of the things we learned along the way.

The first time I had a look at the river with the Council staff it was difficult to actually see the river itself so we decided the first thing to do was mulch the vegetation so that we could at least see what we were dealing with. While the mulching work was going on I met with local residents as they explained how the river system worked. This at least gave me a starting point so that we could go and look at what may need to be done.

Recessed headwall and floodgate

Next item was to identify all of the scheme assets, i.e. stopbanks, floodgates and miscellaneous structures. The floodgates we decided needed to be easily identified so we set about erecting white marker posts, marked with the asset number, on top of the stopbank. This eliminates confusion over which asset someone is referring to later on. We then started compiling an inventory of the assets including photographs and a preliminary assessment of the condition so that we could prioritise any works that need to be undertaken.

Next we looked at those locations where we had slips and erosion occurring.

Erosion of the embankments was easier to deal with as this is generally caused by turbulence from an obstruction or impediment upstream. Getting the plant operators into the mindset of imagining themselves in the water and flowing downstream enabled then to assess what needed to be so that we would discuss and agree the works before we started.

With the slips we made an assessment of what may be the triggers and how best to fix them then called in the geotechnical engineers to confirm whether we were on the right track and then got on with the repair.

Floodgates became the next challenge, as there were a huge variety of gates within the system. Having previously developed a simple system for the Far North District Council we utilised the same design for Regional Council. Best done by taking a standard precast headwall and casting a sloped face on the headwall, fixing a reinforced conveyor belt over the sloped face anchored to the headwall, angling the headwall downstream with the flow and recessing the headwall into the embankment. Long culvert socks also make ideal floodgates for small pipes, up to 450-mm diameter, as they can float on top of a flood and shut off when the water rises above the pipe.

All of these ideas got tested during the February 2007 and July 2007 events and proved that we were on the right track. ≈

ABOUT THE RIVERS GROUP

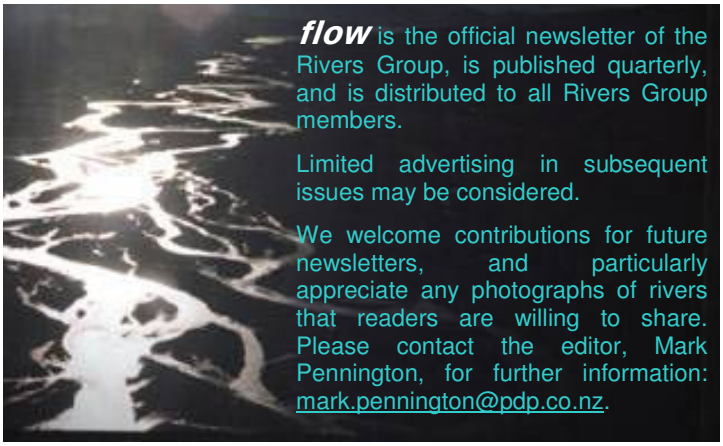
The Rivers Group was formed in 2009 to provide a forum for those involved with, and with an interest in rivers, flood risk management and the operational and environmental issues of catchments and river systems. The Group incorporates a wide variety of fields of practice and interest to do with rivers, (e.g. cultural health, water quality, water quantity, flood management, energy generation, environment protection, etc.) promoting a multi-disciplinary and culturally-sensitive approach for river management in an integrated and holistic manner.

Please visit our website at www.ipenz.org.nz/riversgroup for information on the group's activities, membership application and for contact details of committee members. Alternatively email riversgroup@ipenz.org.nz for direct contact. ≈

FROM THE CHAIR

Stephen Coleman, Chairman of the Rivers Group

Welcome to the first newsletter of the Rivers Group. It's been a busy few months establishing the group and developing plans towards addressing the varied focuses of our enthusiastic membership. We hope that you will enjoy the interesting rivers articles that we've assembled for this edition. Also, take note of the highlighted upcoming activities, check our website for information updates as they arise, and be sure to let us know of potential future activities and articles that we can distribute further to the group membership. Nau Mai Haere Mai. ≈



flow is the official newsletter of the Rivers Group, is published quarterly, and is distributed to all Rivers Group members.

Limited advertising in subsequent issues may be considered.

We welcome contributions for future newsletters, and particularly appreciate any photographs of rivers that readers are willing to share. Please contact the editor, Mark Pennington, for further information: mark.pennington@pdp.co.nz.