

Water Matters

The Annual Report of the Waterways Centre for Freshwater Management – 2017

Director's Review 2017

2017 was another very busy and successful year for the Waterways Centre and, as we now look ahead into the early months of 2018, it does look like "busy" is not going away anytime soon! 2017 saw the graduation of our second PhD in Water Resource Management (WRM) and our first Masters graduate at Lincoln University, as well as the completion of 10 Postgraduate Diplomas in WRM. 10 Masters WRM research theses are due to be submitted before the end of February 2018, and many of you will have had the opportunity to hear about this diverse research at the Waterways Postgraduate Seminar Day.

2017 was also a year for freshwater issues in the headlines again, with the Government's new policy on creating "swimmable" rivers leading to a very robust public debate, and the possibility of charging for all water use becoming a central election issue. New courses and new staff have enhanced our ability to help educate and undertake the research required to

address such complex freshwater management problems. For example, teaching courses have enabled us to provide better education on irrigation approaches, and effective, sustainable, groundwater management.

In the second half of 2017 we were able to appoint two new staff; a new senior lecturer in Water Management and Policy at the University of Canterbury, Dr Ed Challies, and a research project manager (partly sponsored by Ngai Tahu) at Lincoln University, Katie Nimmo. Ed taught one of the core Postgraduate courses for us in 2017, making it down from Nelson every Friday, despite the challenges of inclement weather and uncertain flights. He made his life (and ours) easier by moving to Christchurch late in 2017 and joining the Centre on a full time basis. Katie divides her time between supporting research groups within the Centre, and implementing a new monitoring strategy for Te Waihora with Ngai Tahu and ECan. Unfortunately, in 2017 we lost Professor Ian Hawes to the University of

Waikato, although he remains a frequent visitor and close associate of the Waterways Centre.

Our annual report is intended to highlight our accomplishments for 2017, and to provide you with an insight into the Centre's operations and ongoing development. If you wish to follow up on these stories, please see our website for further information, publications, reports and



The Director after testing the "swimmability" of the Severn River, North Canterbury.

other research and teaching news, or contact the Centre directly. We are more than happy to add interested parties to our contacts list!

Jenny Webster-Brown,
Director,
Waterways Centre

Master Thesis Students



of Landscape Architecture.

Abigail Mark was the first MWRM student to graduate from Lincoln University, in May 2017, after completing her thesis on how dairy farmers manage fenced riparian areas in Canterbury, supervised by Wendy McWilliam and Simon Swaffield in the School



Katie Coluccio, MWRM, is investigating the surface/groundwater interactions of braided rivers, under the supervision of Dr Leanne Morgan. Katie's work is supported by a grant from the Ian Glassey Memorial Fund, and focusses primarily on the Ashburton River. Katie has spent many hours devising methods for measuring the complex interactions, and expects to submit her thesis in early 2018.



the environment as well as the people and Bhutan's Gross National Happiness Index. Sonam conducted her research in Bhutan in 2017 through focus groups and interviews, and will submit her thesis early in 2018.

Sonam Pem, MWRM, is a New Zealand Scholar from Bhutan. Supervised by Waterways Centre member Dr Kelly Dombroski, Sonam's research looks at Bhutan's Thimphu River, and how its health impacts the wellbeing of

Waterways Postgraduate Conference 2017



MWRM student Nekelia Gregoire and Stephen McNally, Opus, at the PG student conference.



Dr. Rod Carr opening the Conference

The annual Waterways Postgraduate Student Conference was held November 14, with an ever growing and diverse audience of around 130 interested water industry, regulatory and community stakeholders.

Presented research topics ranged from virus transport through soil from on-site wastewater treatment systems, to the distribution of antibiotic resistant bacteria in waterways, to changes in groundwater following irrigation conversion. There was considerable interest in many of the topics presented, with further

invitations to students to present their work at other conferences and to different audiences. Each year the student presentations get better, and the conference gets bigger, as word spreads. The conference was held once again in the Stewart Building at Lincoln University, and was opened this year by the University of Canterbury VC, Dr Rod Carr. Our winners on the day were; Tara McAllister (PhD WRM) for best oral presentation, with Nekelia Gregoire (MWRM) and Katie Collins (PhD Biology) in 2nd and 3rd place respectively. Poster prize winners were Katie

Collins (PhD Biology) and Ben Michell (PMEG, Geology). Our long-time supporters, IPENZ River's Group, awarded the IPENZ prize for best river presentation oral to Tara, and best poster to Katie Coluccio (MWRM). New this year was the People's Choice award, which went to Brandon Goeller (PhD, Biology). Grateful thanks to all of our sponsors who collectively provided more than \$5500 support for the conference this year, as well as being well represented on the day. We do very much appreciate this support!

Groundwater Teaching Takes Off

Leanne Morgan has commenced a very active groundwater teaching and research programme since starting with Waterways as the senior lecturer in Groundwater Studies in mid-2016.



In 2017 she taught ENGE414 (Applied Hydrogeology) using several groundwater wells on Ilam Fields that had been forgotten in recent years, but rediscovered by Leanne while she was traipsing through Ilam Gardens.

Along with conducting pump tests, measuring water levels and flow, some enterprising Engineering Geology students were also able to take video underground. Two Professional Masters of Engineering students; Simon Demler and Ben Michell, used the wells for research in 2017, supervised by Leanne. Ben developed a pneumatic slug test pump that attracted considerable interest (and a prize!) at the Waterways Postgraduate Conference. Leanne also teaches groundwater concepts and skills within other WATR courses at both UC and LU, and students are responding positively to the hands-on activities that access to a field site allows.



Ben Michell using the pneumatic slug test kit he developed on the Ilam Fields wells.

Scholarship Recipients

In 2017 the Waterways Masters scholarship was awarded to Christopher Meier, Biological Sciences at UC, for his research looking into conservation of the Canterbury mudfish. Fees scholarships were also provided to Master WRM student, Courtenay Bremner, who is looking at biofilm growth in raingardens with an eye to increasing the absorption of heavy metals, and Master of Environmental Science student, Lewis Black, who is examining historical and ongoing pollution into Haytons Stream in Christchurch.

The Waterways Contestable fund of \$5000 was fully allocated across a number of students undertaking freshwater-related research, supporting activities from conference attendance to field costs. The Meadow Mushroom Scholarship went to GIS Masters student Simon Coats in 2017.

In response to enquiries from organisations wanting to fund or contribute to freshwater research in a field of importance to them, the "Waterways Stakeholder Fund" has been set up with the UC Foundation. This enables organisations to pay into the fund, and to specify an area of research they seek to support, while also allowing flexibility in the funding amount and time taken to find an appropriate student to undertake the research. If you are interested in the fund, please contact the Waterways Centre. We see this as a way of providing better support for (particularly Masters) students at a time when they typically have limited financial resources.

Examples of stakeholders who have fully funded Master scholarships or supported student

research in 2017 have included; **ESR** for work on virus transport through soil from on-site wastewater treatment systems, **Mayfield-Hinds Irrigation Scheme** for research on groundwater in the Mayfield-Hinds area, and **Advance Ashburton** (a scholarship from the Ian Glassey Memorial Fund), for research on the Ashburton River. This year also saw the first award from the **Sam and Pam Stewart Memorial Scholarship** fund, which supports environmental work in South Canterbury. Tara McAllister and Katie Coluccio both received top up funding to conduct their field work, which involves travel to South Canterbury rivers. Waterways extend their thanks to all for their generous support!

Summer Scholarships Students

During the 2016/2017 break three summer students completed projects for Waterways (refer Waterways website for the completed reports); Sam O'Sullivan worked on a systematic review of options for preventing phosphorus release, particularly relating to Wairewa/Lake Forsyth, Irene Setiawan conducted a thorough survey of the drying reaches of the Avon River, looking at how flow conditions have changed in the river, and Katie Coluccio completed a project on the Ashley River surface water/groundwater interactions. The reports from these summer projects are available via the Waterways website. Two further summer scholarship projects were awarded for the 2017/2018 summer (watch this space).

Research

Research themes moving forward

One of the aims of the Waterways Centre when it was set up was to integrate disciplinary water research to provide interdisciplinary solutions to freshwater management problems by bringing together water research expertise and facilities at both UC and LU.

With this in mind, seven research priority themes were developed in consultation with Waterways Members and the Advisory Board in 2014/15. However, it wasn't until our Research Project Manager, Katie Nimmo, started work with the Centre in August that the research themes became active and the connections between members and themes were made. Katie's work involves tracking the research already taking place across the nearly 50 Waterways members and postgraduate students, facilitating communication between researchers and helping to address gaps within current research.

The Waterways website will shortly include a research page that will highlight active research, specific researchers and key outcomes for each research theme.

Mine rehabilitation research

The Waterways Centre is involved in research led by Coal Research Limited, to establish a "Mine Lifecycle Guide" for the mining industry.



A key part of this research is understanding the factors that influence the success of mine rehabilitation, and particularly how this affects

water quality and ecosystems downstream of a mine site. The MBIE-funded programme also involves researchers from the University of Otago and Landcare Research, and work on historic and current mine sites from all over New Zealand. At Waterways, PhD student Marlese Fairgray is supported by this programme and is part way through her research on the use of geochemical modelling to predict the behaviour and toxicity of metals released during mining (such as arsenic, mercury, copper, lead, cadmium and zinc). She is working on mine sites as diverse as an old mercury mine in Northland, a rehabilitated zinc mine on the Coromandel and a coal mine on the West Coast.

PhD student profiles



Qian Hu

Qian Hu came from China to the Waterways Centre to work on a PhD research project on factors affecting the translocation of lake macrophytes. Funded by the Whakaora Te Waihora initiative, Qian's work has focussed on factors impacting macrophytes growth and relocation in Te Waihora/ Lake Ellesmere. Macrophytes once flourished in this lake, but have never re-established following the Wahine Storm in the 1960s. During his time in NZ, Qian has become adept at wading in the murky waters of the lake looking for specific species of plants and setting up experiments to test their responses to various conditions, along with other adventurous pursuits such as surfing and cooking. Qian has been supervised by Professor Ian Hawes and Dr Matthew Turnbull (Biology) and will submit his PhD for examination in February 2018

Tara McAllister

Not content with her two prizes from the Waterways Postgraduate Student Conference, PhD student Tara McAllister walked away from the NZ Freshwater Science Society Conference in Hamilton in late November with "Best student oral presentation" as well. Tara's research focusses on *Phormidium*, the toxic algae present in New Zealand rivers. Due to finish her thesis in early 2018, Tara has been supported by a Ngai Tahu Research Centre Doctoral Scholarship throughout her PhD, and supervised by Professor Ian Hawes, and Dr Susie Wood (Cawthron Inst).



Tara McAllister and Channell Thoms (PhD Biology) just before the NZFSS conference dinner (a flower-power theme!).

Out there: Outreach and Communication

One of the roles of the Centre is to inform public debate and policy decision-making on freshwater issues. This is often through the media with Waterways staff active through 2017 with 4 articles in various newspapers, and 6 in magazines (some web-hosted), and 3 interviews on RadioNZ. All communications were attempts to show the importance of factual information (and the collection of this information) in water issues, and to shift embedded perceptions of the nature of water resources.

As always, attendance and presentation at national and international conferences is a critical part of every staff member and students' year. In addition to participating in the end-of-year annual NZ Freshwater Science and NZ Hydrological Society conferences, a select group of Waterways and Civil and Natural Resource Engineering Masters students were invited to make presentations to the regional meeting of Water NZ on Aug 25. The presentations were well received and generated good discussion.

Waterways hosted Dr Eric Crampton, Chief Economist at the New Zealand Initiative to speak at the launch of Waterways member Mark Milke's book "Smart Markets for Water Resources" at

Illam Homestead in April. Dr Crampton gave a thought provoking presentation on the state of water markets in NZ and their possible implementation. Later in the year the Centre also hosted and co-sponsored this year's Darcy Lecture "A Tale of Two Porosities: Exploring Why Contaminant Transport Doesn't Always Behave the Way It Should" presented by Dr Kamini Singha. The other sponsors were the Canterbury Branch of the Royal Society and Aqualinc.

Waterways members and students were also out in the community with presentations to the Ashburton and Christchurch West Melton zone committees, and to GreyPower in Timaru (on "Cows and Clean Water"). Students and staff also participated in community river clean-up and riparian planting programmes in Christchurch city, and in the Styx Living Laboratory initiative, as well as assisting the He Puna Pūtaiao high school outreach programme at UC.

Technical publications and reports

Core staff and student of the Waterways Centre have published 9 journal articles and 4 technical reports in 2017, as well as presenting at various national and international conferences. Details

of publications, theses and technical reports can be found on the Waterways website, the UC Research Repository, and on staff member's research profiles on the university websites.

Admin notes

The Waterways Centre continues to function as a joint university research and teaching centre: a collaboration between the University of Canterbury and Lincoln University. The operations of the Centre at both universities is governed by a formal MoU, and offices and laboratories exist at both the Lincoln and Christchurch campuses.

A 7 member external Advisory Board (with current representation from NIWA, Aqualinc, Ngāi Tahu, Fish & Game, IrrigationNZ, Our Land & Water Science Challenge and Environment Canterbury) has strategic oversight, while the day-to-day operations are the responsibility of a small team of core academic and general staff, guided by a consultative committee made up 2 academic staff from each university.

In 2017, the 17th Advisory Board meeting was held on 27th February, and the subsequent Consultative Committee meeting on 22nd May.

Staff News

Ed Challies Senior Lecturer Water Management and Policy

Waterways welcomes Dr Ed Challies, Senior Lecturer in Water Policy and Management, who started full time January 2018. Ed is a graduate of Victoria University of Wellington, and came to us from the Institute for Sustainability Governance at Leuphana University of Lüneburg in Germany. He has co-led a large European Research Council-funded project investigating the effectiveness of collaborative governance – with a focus on water resource management under the European Water Framework Directive and the Floods Directive.



Ed coordinated the WATR403/603 course in Semester 2, 2017, eliciting very positive feedback from students and guest lecturers. He hits the ground running this year, already supervising several MWRM thesis students, and teaching three courses. Ed brought his partner Isobel and their three young children from Nelson to Christchurch in November, and they are settling into Canterbury life.

Katie Nimmo Waterways Research Project Manager

Katie Nimmo joined Waterways in August 2017 as our much needed research project manager. Katie came to us from the University of Canterbury's Sustainability Office and holds a Masters in (Applied) Social Science Research with Distinction (Victoria University of Wellington). She brings over 15 years of



experience managing social science research and sustainability-oriented community engagement projects. Along with coordinating the Centre's priority research themes Katie will be implementing an integrated monitoring strategy for Te Waihora/Lake Ellesmere. Katie's position is partly funded by Te Rūnanga o Ngāi Tahu, and she splits her time between Lincoln University and University of Canterbury.

Waterways babies

Emma MacKenzie, our part time Lab Supervisor, tutor and assistant researcher, welcomed twin boys in December 2017. Iain and Revan are happy, easy babies but make Emma's life a little more complicated these days.



The Waterways Centre for Freshwater Management is a teaching and research centre, jointly supported by the University of Canterbury and Lincoln University. Established in 2009, it aims to improve the knowledge-driven management of freshwater resources by offering a full complement of nationally accredited tertiary courses and actively supporting postgraduate research programmes.

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