Water Matters

The Annual Report of the Waterways Centre for Freshwater Management – 2016

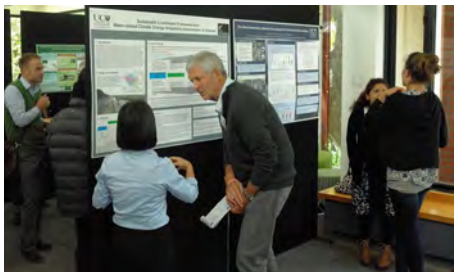
Waterways Postgraduate Seminar Day 2016

The annual postgraduate seminar day in November is the highlight of our calendar; an all-day conference to showcase all of the research being undertaken by postgraduate students affiliated with the Centre.

This year 22 oral presentations and 12 posters detailed research projects ranging from improving water supply and sanitation systems in Pacific Island nations, through urban stormwater and landfill leachate treatment, to better management of lowland streams and lake ecosystems right here in Canterbury. A copy of the conference programme and abstracts is available from the Waterways website.

The conference was held once again in the lovely Stewart Building at Lincoln University, and opened by the new DVC Research at the University of Canterbury, Prof Ian Wright. Our winners on the day were; Phil Clunies-Ross (PhD WRM) for best oral presentation, with Katie Collins (PhD Biology) and Mando Chitondo (M WRM) in 2nd and 3rd place respectively. Poster prize winners were Salina Poudyai (PhD Engineering) and Fabio Sylveira (M Engineering). Our long-time supporters, IPENZ River's Group, awarded the IPENZ prize for best river presentation oral to Mark Yungnickel (M Biology), and for best poster to Val McMillan (M WRM). Grateful thanks to all of our sponsors who collectively provided more than $2400 support for the conference this year, as well as being represented on the day along with over 130 attendees. We do very much appreciate this support!

The 2017 conference is set for November 14 – mark your calendars!



Poster judging in progress!

Katie Collins presenting her PhD research on weed macrophyte control in agricultural waterways

Director's Review 2016

Our year began on a very positive note with the (re)signing in February of the MoU between the University of Canterbury and Lincoln University that governs the operation of the joint Waterways Centre for the next 5 years.

The respective Vice Chancellor's, Dr Rod Carr and Dr John Hay, confirmed the ongoing commitment of the senior administration of both universities to the vision of the Waterways Centre and kicked off another busy year for the Centre. With strong enrolments at both universities in all of our undergraduate and postgraduate courses, we also had a record number of Masters thesis students (18) beginning their research in 2016. Our two first PhD students in Water Resource Management (WRM) completed their degrees in 2016, along with 9 Masters WRM and 12 Postgraduate Diploma WRM students. Each one of these former students enters the workforce with (we hope!) a good working knowledge of what it will take to manage our water resources sustainably into the future.

We have also expanded on the staffing front with a long awaited appointment of a new senior lecturer in Groundwater Studies; Dr Leanne Morgan. Leanne arrived from Flinders University (in Adelaide) in July and immediately took on lectures in 3 different courses, as well as a number of thesis students.

Our annual report is intended to highlight these and other accomplishments, and to provide you with an insight into the Centre's day-to-day operations and ongoing developments. For those that wish to follow up on these stories, our website includes further information as well as publications, reports and other research and teaching news.

Jenny Webster-Brown,
Director, Waterways Centre

Signing the MoU between University of Canterbury and Lincoln University, for the Waterways Centre continued operation as a joint teaching and research centre, in February 2016.

Waterways
Centre for Freshwater Management

Lincoln University
Te Whare Wānaka o Aoraki
CHRISTCHURCH•NEW ZEALAND
New Zealand's specialist land-based university

UC
UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Teaching

The family of undergraduate "WATR" courses expanded rapidly in 2015 and 2016, with a number of specialist courses now being taught in addition to the mainstream WATR 201 (Freshwater Resources) and WATR 301 (Water Resource Management) courses.

These include WATR 202 and WATR 302 focussing on the agricultural use of water, taught at Lincoln University, and WATR 203, a freshwater field skills course, taught as a summer course at University of Canterbury. WATR 302, (taught for the first time in 2016) involves a collaboration with IrrigationNZ to teach irrigation system design.

At postgraduate level (for the PG Diploma WRM and Masters WRM qualifications) a new "Research and Communication Methods" course (WATR 404/605) ran for the first time in 2016, providing a good foundation for potential thesis students preparing for their research year. The three core WATR courses (401/601, 402/602 and 403/603) all had record high enrolments, with over 40 students in most classes; a mixed blessing for teaching processes, but gratifying to see the growing interest in water management.

Water 402/602 students gauging water flow in Liffy Stream at Lincoln

The Master Water Resource Management programme underwent a formal 3yr CUAP review in mid-2016. It received a favourable report and few changes to the current format were recommended.

Master Thesis Student Profiles

Will Dench

Will's research is looking at how conversion to spray irrigation on farms near Ashburton in Canterbury has affected groundwater quality and levels in the region. He is sampling groundwater wells, and will compare his results to similar study conducted in the area 10 years ago, when flood irrigation was the normal practice. The research is supported by a scholarship from the Mayfield Hinds Irrigation Scheme.

Will in The Mayfield/Hinds area with a spray irrigation system.

Phonesavath Khamvilay

Phoesavath is evaluating community involvement in a hydropower project in the Lao People's Democratic Republic. This is one of the largest hydropower development projects in Lao PDR, and is the main factor supporting socio-economic growth in its region. Participation of local communities in hydropower planning is crucial in order to ensure that a development project is planned and implemented in a sustainable way. This research analyses the evolution and effectiveness of the Multi-Stakeholder Processes (MSP) applied during project development and operation.

Phonesavath presenting his poster to Dr Hugh Thorpe at the Waterways PG Seminar Day.

Our largest international cohort gets ready to graduate

The 2015 Masters intake was the largest to date and included 10 NZAid scholarship students, funded by MFAT. They began their thesis research in 2016 and will return to their home countries in March 2017, taking their new skills and knowledge back with them. These international students have remained a tight knit group, from their first bemusing weeks to their pressured thesis writing, and have continued to support each throughout. We have enjoyed their participation and will miss them greatly when they go. They attended an early graduation ceremony, held in November, as they are not able to come back to attend official graduation ceremonies. All the best to all of our international students as they strive to get those theses completed!

2016 saw the graduation of 9 Masters WRM and 12 Postgraduate Diploma WRM students, including Tom Swan, who completed his research thesis on mosquito control in Tonga supervised by Prof Jon Harding (UC), and Toiata Apelu, who completed her research on community perspectives on Samoa catchment conservation policies, with Dr Ronyln Duncan (LU).

Masters WRM graduates Tom Swan and Toiata Uili Apelu, who graduated in May.

PhD student profiles

Tara McAllister

Tara's research is on the factors controlling *Phormidium* growth and bloom dynamics. *Phormidium* is a type of cyanobacteria capable of producing toxins, and its presence in the rivers and streams of New Zealand over summer greatly reduces recreational use of these waterways. Algal toxins can affect all water users, and are particularly known for their fatal effect on dogs. Tara spends much of her time in Canterbury's rivers, from the Ashley in the north to the Rangitata in the south, monitoring and experimenting with *Phormidium* growth rates and patterns. She has prepared reports on her work for Environment Canterbury to help with management of *Phormidium* occurrences, and has won awards for the oral presentation of her research at NZ Freshwater Science Society conferences (where she was recently elected as a Maori representative on the Executive Committee), and this year at the Cyanobacteria conference in Australia. She is now in the final stages of her PhD.

Tara sharing her methods for algal growth assessment on a WATR course fieldtrip.

Shane Orchard

Shane and Tom Moore from EOS Ecology marking out sites for the artificial spawning habitats used in the Whaka Inaka project: Photo: ©EOS Ecology.

Shane's PhD is on resilient shorelines and how to provide a platform and underlying database to support community-based restoration projects and environmental monitoring. He made news in 2016 with his findings on increased whitebait breeding sites post Canterbury earthquakes. In partnership with ESR and the Brian Mason Trust, Shane had surveyed the Avon and Heathcote rivers, along with several West Coast rivers, looking at breeding sites for various species of whitebait. As a part of the very successful project "Whaka Inaka", a collaboration between the Waterways Centre and Marine Ecology Research Group at UC, EOS Ecology and Te Rūnanga o Ngāi Tahu, opportunities for restoring īnanga spawning habitat following the earthquake-driven large scale changes to Christchurch's waterways were identified. Whaka Inaka had a strong community focus with many local people, community groups and schools being involved at different stages of the project. He has also been developing a fine-scale salinity model for the Avon Heathcote Estuary Ihutai with NIWA.

Scholarship recipients

In 2016 the Waterways Masters Scholarship was awarded to George Barbour. George has almost finished his thesis on solar disinfection for drinking water, focussing particularly on Kiribati, where the source water is highly contaminated. A fees scholarship was awarded to Christopher Sampson, who is undertaking his thesis research on the effects of trace elements in road dust on sediments in urban waterways with Dr Sally Gaw.

Our long-time supporters, Meadow Mushrooms, continued their sponsorship of water research with a Masters scholarship to Mark Yungnickel, researching whitebait population dynamics around New Zealand, and sponsorship for PhD student Phil Clunies-Ross, for his work on glacial sediment characterisation.

Environment Canterbury funded three summer scholarships in the Waterways Centre in late 2016; A survey of the dry reaches of the Avon river catchment (awarded to Irene Setiawan, Lincoln University), a literature review of mechanisms for preventing the release of phosphate from lake sediments (to Samuel O'Sullivan, University of Canterbury) and better definition of the Ashley River Surface water groundwater interface (to Katie Coluccio, University of Canterbury).

We also had our first scholarship from the private water stakeholder sector, with Mayfield Hinds Irrigation Ltd providing a Masters Scholarship to Will Dench for his thesis research on the effects of changing irrigation systems in the Mayfield region. We hope to be able to provide more opportunities for private sector investment in student research in the near future, with the "Waterways Stakeholders Fund" negotiations in the final stages.

Administration Notes

The financial operation of the Waterways Centre continues to be through University of Canterbury, where the Centre completed 2016 on budget and exceeded the required contribution to the University.

The 16th Advisory Board meeting was held on 5 February 2016 and the subsequent Waterways Centre Consultative Committee meeting held on 20 April 2015.

Research

First PhD graduates

Our PhD students are the vanguard of Waterways Centre research, and our first PhD WRM students graduated in 2016. We congratulate Dr Sean Waters and Dr Meg Devane. Sean completed his PhD on the mechanisms of phosphate release from coastal lake sediments in February and graduated in the December ceremony. His research has informed management decisions concerning Lake Forsyth/ Wairewa on Banks Pennisula which has suffered massive algal blooms, driven by phosphate availability, in recent years. Sean is now working with Cawthron Institute in Nelson. Meg competed her PhD on the development of better water quality indicators for understanding the movement and persistence of faecal bacteria in freshwater systems mid year – very timely research in view of the *Campylobacter* outbreak in Havelock North in August 2016. Meg works with ESR.

Dr Sean Waters graduating with his PhD in December.

Whakaora Te Waihora research

Te Waihora/Lake Ellesmere is the 5th largest lake in NZ, and right on the doorstep of Christchurch city. The Whakaora Te Waihora (WTW) initiative supports research aimed at improving the water quality and environment of this huge, shallow coastal lake. Two WRM students are involved in Dr Ian Hawes' research contract with NIWA on factors affecting the lake's plants; PhD student Qian Hu has been looking at whether the macrophytes that originally populated this shallow eutrophic lake can be re-established and M WRM student Emma McKenzie completed her thesis on the role of nutrients and light on phytoplankton growth in the lake. Emma has continued to work on this project since graduating - looking at the effect of recently installed wave barriers on the turbidity of the water, and subsequent light available for growth of the plants.

Out there: Outreach and Communication

It is part of the mandate of the Centre to communicate water management information, to inform public debates and policy decision making on water issues. Our PhD students have led the way for the Centre this year, with communication in the media and at conferences, and have been well recognised for their communication efforts.

Phil Clunies-Ross presented his work on glacial sediment at the Australasian SETAC conference in Tasmania, and Marlese Fairgray presented on post-mine remediation water quality at the Tui mine (Coromandel) at the AusIMM conference in Wellington. Marlese was also a part of a strong Waterways Centre contingent at the annual NZ Freshwater Sciences Society conference in Invercargill in December, where Tara McAllister won "Best Applied Science Presentation" for her talk on *Phormidium*, and was appointed as the Maori Representative to the NZFSS executive committee at the AGM. Tara's year also included presentations at the "Harmful Algae" conference in Sacramento (USA) and at a Cyanobacteria conference in Australia, where she received the best student presentation award.

Shane Orchard won the Best Overall Presentation prize at the New Zealand Coastal Society conference *He Waka Eke Noa*: Linking Science, Engineering, Management and Community, where he presented on improving spatial data analysis capabilities in the national citizen science platform, NatureWatch NZ, and co-led a workshop on Coastal and Marine Citizen Science. He also presented his research on applying vulnerability assessment to īnanga spawning sites at the NZFSS conference.

Masters student Erik Kilaka's research on the effect of shelterbelts on irrigation evaporation rates was presented at the biennial IrrigationNZ conference in Oamaru, and at the NZ Hydrological Society conference in Queenstown. The results of a study of artesian spring activity in the Christchurch urban area, which began as a summer WCFM project by Lincoln University student Emma Barr, were also presented at the Queenstown conference.

Staff also busy

In a year where it seemed every day brought a new story on the state of New Zealand's freshwater, the Waterways Centre's core staff academics seemed to be in high demand for comment, both in printed media and for Radio NZ and Radio Live. With the difficulties of communicating reliable information becoming ever more apparent, science communication workshops were organised for both the NZ Hydrological Society and NZ Freshwater Sciences Society conferences at the end of 2016. An analysis of "What stops us speaking out?" as scientists and academics was also given as an invited plenary session at the NZ Freshwater Sciences Society conference.

The Waterways Centre hosted a "Water Forum" for Christchurch City and Environment Canterbury councillors and staff, in September 2016, looking at the changing nature of the city's waterways. Media stories regarding the visible changes in the urban waterscape led the City Council to request briefings by Waterways staff at this forum, and again for new councillors in December.

The core staff of the Waterways Centre continue to present their own research at various conferences, nationally and internationally (details are available on the University of Canterbury staff profiles pages), but also maintain strong links to community and agency groups concerned with various aspects of water quality and quantity. These include roles on various science and technical advisory groups (e.g., for regional councils) and advisory boards, as well as peer review duties.

Technical publications and reports

Core staff and students of the Waterways Centre have published 10 journal articles of relevance to freshwater management and 3 WCFM technical reports in 2016, as well as presenting at conferences and publishing conference papers proceedings. Details of publications, theses and technical reports can be found on the Waterways website.

New (and renewed) Staff

In July 2016 Leanne Morgan joined us as the Waterways Centre's newest staff member. She had barely arrived before being besieged by students wanting to talk about possible groundwater research ideas, and by staff seeking lectures into their courses. She has hit the ground running, already supervising or co-supervising 8 MWRM students and teaching into WATR401, 402, 302 and ENCN499 in her first semester. Thankfully she is enthusiastic and passionate about teaching, which shows in the level of engagement in her classes; and external engagement, already working with Environment Canterbury. Leanne is excited about the opportunities that exist for research on Canterbury groundwater and we are very happy to have her!

Emma MacKenzie has joined Waterways Centre as a part time Lab Supervisor (filling in for John Revell in the Waterways Lab on Fridays), tutor and assistant researcher. We are loving Emma's skill in organisation and management, and her sunny nature. Welcome Emma!

The position of Senior Tutor had to be re-advertised when it changed from a fixed term to a continuing position. Julie Clarke (previously Abbari) who had been in this role since 2012 reapplied and was appointed as our first permanent Senior Tutor in March. No-one else could possibly deal with the complexity of the Waterways teaching programme with such competency, grace and calm!

Adjunct Staff

2 new adjunct staff have been appointed to the Centre; Dr Clint Rissmann (Environment Southland/ Our Land and Water Challenge) was appointed as an Adjunct Senior Fellow in May, and Graeme Horrell (Consultant Hydrologist) as an Adjunct Fellow in September. Both have already made a valuable contribution towards postgraduate teaching, and in joint research initiatives.

Clint Rissmann

Graeme Horrell

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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