

Master of WRM Thesis Topic Ideas

	Priority Research Themes	Research Aim
1	Managing Better I: Technology & Infrastructure	To develop and assess innovative infrastructure, technologies and BMPs to improve water use efficiency and reduce water contamination, while supporting economic growth in the industry sector.
2	Managing Better II: People and Water	To build a better understanding of the relationship between people and water, in order to underpin alternative, sustainable freshwater management approaches that meet iwi, community and economic aspirations for the resource.
3	EoRE End-of-river environments	To develop best practice for the protection of ecological, iwi, community and recreational values in lower catchment environments, such as river mouths, coastal lakes and estuaries. Encompasses the Lake Research Centre Initiative for Te Waihora.
4	Blue-Green Urban Waters	To better manage water use, discharge and re-use in an urban environment, assessing infrastructure and processes that enhance the value of urban water, promote efficient use (e.g., recycling) and protect natural waterways.
5	Functional Waterways Networks	To enhance aquatic ecosystem services and biodiversity in water networks, from the mountains to the sea (ki uta ki tai); assessing the ability of ecosystems to adapt to change (in climate, high/low water flow, quality and species invasions), and how network systems can be optimized to improve ecosystem resilience in the face of these changes.
6	Sustainable Nutrients	To minimize nutrient movement, within economic and environmental constraints, from developed land into water, and to reduce the effects of excessive nutrients in water bodies.
7	Sustainable Groundwaters	To improve confidence in the assessment of the effects of groundwater use, utilizing interdisciplinary aspects of groundwater research, applied knowledge and existing monitoring sites and data.

Notes

1. All of the Waterways Centre's research falls within these **Priority Research Themes**. Thesis topics that have been suggested by potential supervisors are grouped under these themes in this document, together with the type of skills that would be needed to undertake this topic, and potential supervisors.
2. Where an **external interest** in the topic is cited, this simply indicates an expressed interest which could translate into supervision, support in-kind or scholarship contributions, or may not. Where a scholarship arrangement has been discussed and is likely, this is denoted by (\$). This cannot be confirmed until an appropriate thesis student is available and the specific research conditions are negotiated.
3. The Skill sets indicated are a very general guide and should not be taken literally. Further clarification can be sought from the proposed supervisor(s) on the skills that would be required. The key is;

PG or HG	Physical Geography or Human Geography
G	Geology
C	Chemistry
B	Biology, particularly ecology
ERM	Environmental and/or Resource Management
E	Engineering
Ec	Economics
M	Maori studies
Ag	Agricultural science or management
L	Landscape Architecture

Multiple skill sets, where indicated, usually imply that the topic can be slanted to suit particular skills.

4. If you see a topic here that interests you, make a time to talk to the proposed supervisor about it. Find out more about what the research entails. Ask about the skills that will be required, and be prepared to talk about what your skills, interests and careers plans are. The topic may evolve and change during your discussion - that is fine as long as the final topic suits both you and your supervisor.
5. Supervisors can only take on so many students for thesis supervision – if they are already “full” they may not be able to help you with a topic. Contacting them as early as possible helps avoid this situation. If it happens, don't take it personally ... It just means you need to continue trying to find a suitable topic.

PRT 1: Managing Better I: Technology and Infrastructure

Thesis topic	Skill set	Supervisors	External interest?
Stream augmentation: Theory and practice. Case study Effelton Irrigation scheme	E, PG	Adrian Meredith /Donna Lill (ECan)	ECan (\$)
Low impact urban design (e.g. green roof) options for minimizing stormwater flows and contaminants in rebuilt Christchurch	E, C	Tom Cochrane	CCC/CWMS Zone Comm.
Developing water efficiency standards for exported goods (as for energy efficiency ratings)	HG, Ec	John Reid (NTRC)	
Stream augmentation: An option for returning "swimmability" to Coes Ford, Selwyn River?	E, PG	Brett Painter/Jenny Webster-Brown	ECan
Effluent from WSUD systems (e.g. rain gardens) and its potential toxicity.	E, C	Tom Cochrane	ECan/CCC
Fish screen design for irrigation races	E	Tonny DeVries (CNRE)	Irrigation NZ
Improved remote sensing of water quality and riparian development	E, PG	Peyman Zawar-reza	ECan
Use of GIS to identify and track land use change.	ERM, PG	Crile Doscher	
Spatio-temporal estimates of soil drainage using soil moisture networks and hydrological/agricultural models	E, PG, Ag	Markus Pahlow	NIWA
Hydrological process knowledge to support flood estimation in small catchments	E, PG	Markus Pahlow	NIWA
Hierarchical calibration of hydrological models	E, PG	Markus Pahlow	NIWA

PRT 2: Managing Better II: People and Water

Note there are many other potential social science/ resource management research topics under this PRT, relating to other catchments and other countries, and to iwi resource management issues. Please look up the research profiles of Kelly Dombroski (UC), Ronlyn Duncan (LU), Hirini Matunga and Simon Lambert (LU) and the Ngai Tahu Research (UC) for further information on potential research areas.

Thesis topic	Skill set	Supervisors	External Interest?
Riparian planting in intensive production landscapes- farmer attitudes and motivations.	B, Ag, L, HG	Simon Swaffield	
Practical application of audited self-management in Canterbury	ERM, HG	Ronlyn Duncan	
Valuing (economically) the aesthetics, recreational and ecosystem services of Te Waihora and its tributaries/drains	B, HG, ERM	Adrienne Lomax & Hamish Rennie	WET
The rise and demise of the commercial fishing community and industry at Te Waihora	ERM, HG, Ec	Hamish Rennie	
Understanding (and modelling?) bird shooter behaviour and choice of bird hide site at Te Waihora	B, HG, ERM	Hamish Rennie	
Selwyn Huts, Greenpark Huts and Fisherman's point community relationships with Te Waihora/Lake Ellesmere and the Selwyn River	HG, ERM	Hamish Rennie	
Foodways and cultural customs of the Te Waihora/Lake Ellesmere Pakeha	HG, ERM	Hamish Rennie	
Recreational use of Te Waihora – past, present and future	HG, ERM	Hamish Rennie	
Land ownership models that encourage sustainability behaviours.	M, ERM		
Cost/benefit analysis of improved water quality (considering wetland, mahinga kai/riparian planting etc).	Ec, B, ERM, M		
Documentation of European settlement of the Te Waihora catchment	HG, ERM	Hamish Rennie	

PRT 3: EoRE: End of River Environments

NB. Many of these relate to Te Waihora/Lake Ellesmere, where there is external interest from ECan WET, Ngai Tahu, ECan, DoC, MPI and others.

Thesis topic	Skill set	Supervisors	External Interest?
A nitrogen budget for Lake Forsyth/ Wairewa	C,B	Jenny W-B & Jon Harding	ECan
What should be the baseline target for Te Waihora restoration?	ERM, B	Hamish R, Jenny W-B	WET
Diurnal extremes in EColi, nutrients and other water quality parameters in Te Waihora and Wairewa.	C, B	Jenny W-Brown & Tim Clough	
Gas fluxes and dissolved gases (e.g, N ₂ O) in Te Waihora.	C	Tim Clough & Ian Hawes	
Coastal shore erosion (accretion rates and determinant factors) in Te Waihora	PG	Hamish Rennie	
Vehicle damage to ecology on margins of Te Waihora	B	Nick Dickinson , Robin Smith	DoC
The effects of higher average lake levels on te Waihora groundwater tables and land use	G, PG	Hamish Rennie	
Assessing the efficacy, efficiency and effects of catchment stock water and flood management schemes at Te Waihora	PG, ERM	Hamish Rennie	
Soil salinity state and trend around Te Waihora.	Ag, C, G	Adrienne Lomax/Jenny W-B	WET
Modelling potential impacts of climate change on Te Waihora	PG	Peyman Zawar-reza	
The relationship between macrophytes and water quality in lowland streams	B	Jon Harding	
Trial treatment wetlands on farm drains flowing into Te Waihora	E, B, C, Ag	Jenny W-B, Annabelle Coates	OPUS (\$)
Amberley Beach Lagoon – is salinity change causing flipping?	B	Angus MacIntosh/Greg Bennet	
Hydrodynamics of Te Waihora and relationship to opening regimes, and catchment dynamics.	E, PG	Tom Cochrane	

Why have freshwater mussels disappeared from Te Waihora?	B	Islay Marsden	
A field investigation of groundwater seepage entering Te Waihora through the lake bed	G, E	Leanne Morgan	
A hydrogeological characterisation of Te Waihora's Kaitorete Barrier.	G, E	Leanne Morgan	
A modelling study of groundwater dynamics in Te Waihora's Kaitorete Barrier.	G, E	Leanne Morgan	
Lake Flies: Factors affecting abundance around Te Waihora.	B	Mike Bowie Jon Harding	
Distribution of invasive plants in Te Waihora	B	Nick Dickinson	
Te Waihora food webs: Role in support of swamp birds	B	Ken Hughey	
Ecosystem services assessment and value (e.g., of invertebrates) for Te Waihora	B, Ec, ERM	Ken Hughey Angus McIntosh	DOC (Philippe Gerbeaux)
Effects of Canadian Geese on water quality and Te Waihora ecology.	B, ERM	Nick Dickinson	
Drivers, obstacles and incentives for the adoption of best practice farm management, to prevent water contamination.	Ag, ERM, HG	Ronlyn Duncan	
Assessing the efficacy, efficiency and effects of catchment pest management schemes (plant & bird two separate topics) at Te Waihora	B, ERM	Hamish Rennie	
Emerging contaminants from current and changing farm practices in the Selwyn catchment.	C, Ag	Sally Gaw, Brett Robinson, Tim Clough.	
Cost-effectiveness of different management options for improving Te Waihora health (considering ecological and economic challenges).	Ec, ERM		

The role of storm events in adding nutrient to Te Waihora and effects of land use on sediment load.	PG, B, ERM	Jenny W-B	
Shoreline accretion rates in Canterbury , and effect of sediment delivery from rivers	PG, E	Chris Gomez, Crile Doscher, Deidre Hart	ECan, CCC
Te Waihora pH levels –should they be manipulated, what do they correlate to?	C, PG, ERM	Jenny W-B	
Current farm drain management practices; impacts on Te Waihora drain water quality and ecology	C, E, ERM, Ag	Jenny W-B	
The effects of elevated E. coli on fish and other aquatic organisms (cf. the effects on humans)	B	Jon Harding or ext supervisor	CCC, ESR
Sustainable Fishery: Impact of commercial eel fishing on customary fishing, and impact of lake closure and seasons.	B, ERM	NIWA researchers?	
Concentration of pathogens present in mahinga kai from Te Waihora and potential health risk	B, C		Ngai Tahu
Priorities for on-farm nutrient limiting practices: Going beyond GMP to reduce nutrient losses	Ag, C, PG, ERM		
Interactions of turbidity, salinity and nutrients, and the effect on algal blooms.	C, PG, B	Brett Robinson	TRONT, ECan
Testing the effects of alum addition to lake sediments columns to reduce P mobility	C, PG, G, Ag	Jenny W-B, Brett Robinson	ECan, SDC
Lower Selwyn spring chemistry (incl. nutrient & isotopes) survey, to determine spatial and temporal variability and establish nutrient pathways.	C, Ag, G	Travis Horton? Jenny W-B	ECan

PRT 4: Blue-Green Urban Waters

Thesis topic	Skill set	Supervisors	External Interest?
GIS modelling of contaminant loading of urban streams in Christchurch	PG, E	Tom Cochrane & Ash O'Sullivan	
Trace metal inputs to the Akaroa Harbour	C	Sally Gaw	
Effects of Ruapuna Raceway use on local air and water quality	C	Jenny W-B & Sally Gaw	ECan
Better building materials for urban waterway health.	C	Jenny W-B	
Trace element concentrations in the sediments of Avon-Heathcote estuary, and their variation through time.	C, ES	Jenny W-B	
Assessment of municipal pesticide use on urban water quality	C	Jenny W-B	

PRT 5: Functional water networks

Thesis topic	Skill set	Supervisors	External Interest?
Changes in land cover/use and riparian planting, and relationship to water quality changes in the Styx River catchment.	PG, B	Chris Phillips, Jenny W-B.	Styx Living Laboratory
The effects of culverts on freshwater fish, in particular crayfish	B	Angus McIntosh, Helen Warburton?	Boffa Miskell (\$)
Effect of wildfires on water quality: Port Hills stream monitoring and assessment	C, B, PG	Jenny W-B, Greg Burrell, Daniel Collins.	NIWA, CCC
Zinc in rural runoff and groundwater systems in Canterbury	C, G	Sally Gaw & Jenny W-B	
Testing new national flood standards through their application to Christchurch	PG, G, E	Terry Day & Tim Davies	
The state of stock water races and their future in Selwyn District – causes, effects, consequences and implications	PG, C, B	Hamish Rennie & Jenny W-B.	
3 Ashburton lakes projects, on factors driving trophic status of the Ashburton lakes, long fin eel recruitment and sediment accumulation (4 topics)	B, C, PG, G	See Jenny W-B for more information	DOC (\$)
The composition of the “first flush” water flow through the seasonally dry beds of Canterbury rivers.	C	Jenny W-B	
Lower Waitaki Catchment monitoring – assessing the effect of more sustainable irrigation on water and nutrient cycling.	C, PG, G	Leanne Morgan, Jenny W-B	Waitaki Irrigators Collective Ltd (\$)

PRT 6: Sustainable Nutrients

Thesis topic	Skill set	Supervisors	External Interest?
Mitigation of N-leaching from rural land	B, C, Ag ,PG	Keith Cameron & Hong Di	
N or P: Do we need to control both to improve water quality?	B, C	Jenny W-B and Ian Hawes	
Baseline nitrate concentrations in Canterbury water – what should we be aiming for?	B, C, ERM	Jenny W-B and Ian Hawes	
Quantification of the effects of irrigation on nutrient cycling in an agricultural landscape	C, Ec, Ag, PG	John Hunt	Landcare (\$)

PRT 7: Sustainable Groundwaters

Thesis topic	Skill set	Supervisors	External Interest
Quantifying the loss from the Ashley River to groundwater	G, C, E	Zac Etheridge & Leanne Morgan	ECan
Quantifying the Waimakariri River's contribution to the Chch groundwater aquifer	G, C, E	Travis Horton & Leanne Morgan	CWMS
Modelling offshore groundwater discharge in the Christchurch coastal aquifers	E, G, C, PG	Leanne Morgan and Zeb Etheridge	ECan
Quantifying groundwater recharge and nutrient transport in Canterbury aquifers at the regional scale using unsaturated zone modelling	E, Ag, G, C	Leanne Morgan & MS Srinivasan	NIWA
Sand-tank and numerical modelling to assess various aspects of seawater intrusion vulnerability in the Canterbury coastal aquifers	E, PG, G, ERM	Leanne Morgan	
Exploring regional-scale groundwater flow patterns in Canterbury aquifers using a new Tothian flow algorithm.	E, PG, G, ERM	Leanne Morgan	
Assessing the viability of a new algorithm for calculating groundwater evapotranspiration using MODFLOW	E, PG, G, Ag, ERM	Leanne Morgan	
Using the nitrate-phosphate-iron relationship to estimate groundwater redox conditions	C, G, PG	Jenny W-B	
Spatial Interpolation of groundwater quality parameters using copulas	PG, G, E	Markus Pahlow	
The effects of Rolleston Sewage Treatment plant on groundwater quality.	C, G, PG	Jenny W-B	
Exploring the implications to groundwater flow and contaminant transport of different – yet equally plausible – degrees of heterogeneity in Canterbury aquifers	E, PG, G, ERM	Leanne Morgan	Lincoln Agritech

Tracking the leachate plume at the now closed Burwood landfill.	G, C, E	Hugh Thorpe	
Groundwater quality in the vicinity of the old Waimairi County "dump"	G, C, E	Hugh Thorpe	