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NEW ZEALAND
Freshwater Sciences Society

NEWSLETTER



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MAIN COVER PHOTO:

Māori Lakes – Ō Tū Wharekai (Ashburton Lakes).

Photo © Dave Kelly

COVER LOWER PHOTOS:

LEFT: World Fish Migration Day fun. See article on page 9.

Photo © Sjaan Bowie

2nd FROM LEFT: Critter of the Year. See article on page 17.

Photo © Shelley McMurtrie

2nd FROM RIGHT: Investigating fish values in the lower Wairarapa Valley. See article on page 39. Photo © Shyam Morar

RIGHT: Working Waters Trust project with Canterbury mudfish. See article on page 66.

Photo © Lan Pham

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Cleaned gravel in the Avon River.
See article on page 54.

Photo © Shelley McMurtrie

INTRODUCTION TO THE SOCIETY



The New Zealand Limnological Society was formed at a meeting in Christchurch in January 1968. It was renamed the New Zealand Freshwater Sciences Society (NZFSS) in 2005 to reflect the broad interests of the membership. Its fundamental aims since inception have been to promote a common meeting ground for freshwater workers in New Zealand and to encourage and promote the exchange of news and views among them. In particular, a newsletter and a list of research workers and their interests is compiled and circulated at least once a year and an annual conference is held. The 2014 subscription is \$55.00 per annum; or \$15 for students, the unwaged, or retired persons. Committee members for the 2013–2014 period were:

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EDITORIAL



NPS-FM, RMA, NEMS, NEMAR, EMAR, NES, SOE, ERB, PCE, MFE, LAWA ...PHEW!

The list of governmental initiatives and developments that were launched over the

last year goes on and on and I have to say, it is difficult- at times – to keep track of which initiative serves which purpose and not just because of the letter puzzle. No doubt the topic freshwater is 'sexier' than ever and what surprises me is this isn't just a flash in the pan, but freshwater related discussions seem to last for a while, indicating that there must be a real issue.

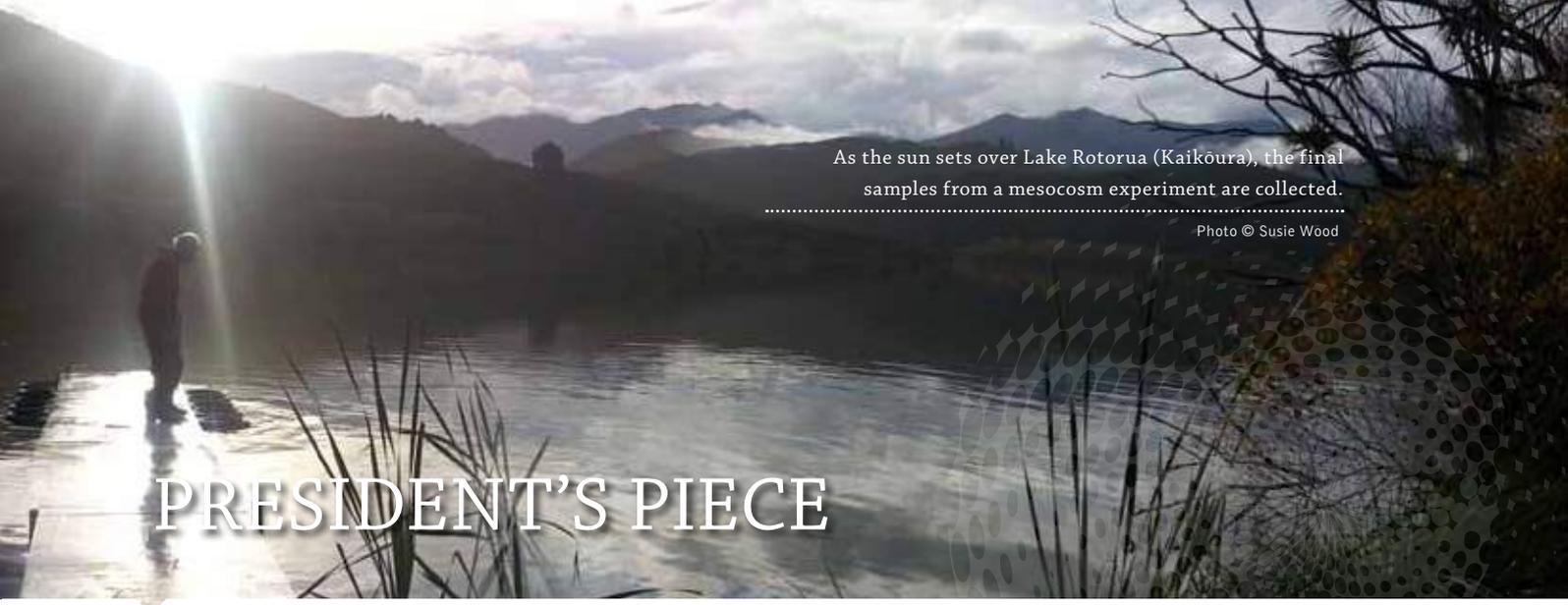
What does that mean for us scientists, policy makers and managers? Well – firstly, we won't run out of work..., but more importantly, it means that our knowledge of freshwater systems is more valued than ever. We have reached a phase, where government have finally started to consult on the 'real deal', asking for advice to assist them in decision-making processes. This doesn't automatically mean that everything we say is listened to, included and implemented, but we all know that 'good things take time', so if we take one little step after another we'll get there in the end. After all, our rivers and lakes didn't get to the state they are in now overnight.

This time-lag of impact and restoration always strikes me, because what it means is that my children might still not be able to swim in some of our rivers when they are grown-ups. This puts some kind of 'reality-check' on the work we do, reminding me why we have to be persistent and patient, keeping up the research, enthusiasm and energy.

This year's newsletter is full of stories that give me that 'reality check' of why we do what we do and I hope you'll enjoy reading it as much as I do. Thanks to Natasha Petrove (co-editor) and Bronwyn Gay, EOS Ecology (layout) for helping take this year's newsletter to yet another level!

Nga mihi nui,

Kati Doehring
NEWSLETTER EDITOR ■



As the sun sets over Lake Rotorua (Kaikōura), the final samples from a mesocosm experiment are collected.

Photo © Susie Wood

PRESIDENT'S PIECE

I am sure, like me, you hardly go a day, let alone a week, without hearing another bad news story in the media about the declining state of freshwater resources in New Zealand. As the 2014 election approaches, freshwater is certain to be a major political issue, and the political parties will seek to either defend their record on freshwater management or propose when lakes and rivers will supposedly be 'cleaned up'. Science has much to contribute to this issue in terms of assessing the state of systems, how long they will take to restore, and what scale of action is necessary to overcome major legacy effects. As scientists we need to ask whether science is being adequately engaged in this process. This involves not only questioning whether, for example, government, local politicians and councillors are engaging with, and listening to scientists, but also whether as scientists we are fully aware of major pieces of environmental legislation, their implications and how they may indeed shape the future direction of research and of our organisation. If you have not already done so, I urge you to have a careful read of the National Policy Statement for Freshwater Management 2014 (NPS-FM). NZFSS has already made comment on the NPS-FM in a media statement. While acknowledging the importance of the NPS-FM as a useful start in dealing with the effects on freshwater systems of diffuse nutrient pollution in particular, the Society highlights the urgent need for a more encompassing approach. The future developments of the National Objectives Framework, as a key tenet of the NPS-FM, will require definition of attributes and limits for wetlands and estuaries to signify the inter-related nature of our aquatic systems and concerns that many wetland and estuary habitats are not only seriously threatened but, without adequate protection, could be at risk of disappearing altogether. Our media statement also drew attention to the need to include additional attributes in the NOF (e.g., sediment and MCI to account for impacts on habitat and multiple cumulative stressors, respectively) and to the grey area of Freshwater Management Units, which have not yet been defined (see the unpopulated appendix in the NPS-FM). The definition of Freshwater Management Units is crucial as it defines the spatial context within which water quality is assessed.

Earlier this year Jon Harding and I had the opportunity to attend the President's Forum at the Joint Aquatic Sciences Meeting in Portland, USA. There was an overwhelming

consensus amongst the various presidents of the societies that science was not being used effectively to guide improvements in freshwater management across the globe. A discussion ensued on the United Nations Open Working Group (OWG) for Sustainable Development Goals. The OWG arose from the United Nations Conference on Sustainable Development, held in Rio de Janeiro in 2012 (Rio+20). The focus of the OWG has primarily been on human health, water supply and sanitation and health. However, recently it has proposed adding the following:

- 6.3: by 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater, and increasing recycling and safe reuse by x% [to be defined] globally;
- 6.6: by 2020 protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes;
- 15.1: by 2020 ensure conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements.

The above points potentially represent an important shift by the United Nations towards an ecosystem-based approach to sustainable development. In this context we need to make sure that New Zealand sets an example for conservation, restoration and sustainable use of its ecosystems by honouring international agreements and meeting timelines that may be set by the OWG (including aligning the NPS-FM to meet or improve upon these timelines).

In our busy schedules we increasingly need to find time to engage effectively with politicians, policy writers and the wider community in order to implement effective actions that meet our international commitments as well as aspirations of local communities and iwi. I hope we will have a chance to meet and discuss some of these issues at our annual conference in Blenheim later this year.

David Hamilton
PRESIDENT, NEW ZEALAND FRESHWATER SCIENCES SOCIETY ■



HE MAIMAI AROHA – FAREWELLS



Eddie White, Limnologist

1933–2012

Dr Eddie White, partner of Janet and father of Mike, Carol and Kathy, died in October 2012 after a long illness.

Eddie White was a limnologist, thinker and an uncompromising scientist who laid a foundation in New Zealand for research on land-use effects on lake water quality. He was a Director of the DSIR Division of Freshwater and Marine Research and founder and manager of the Taupō Research Laboratory (TRL). The laboratory was closed in 1992 with the formation of NIWA. His legacy was not only in his own papers but in fostering a centre of lake science excellence at TRL that was internationally acclaimed. As director he somehow managed a rule-based government agency with an academic flair and demand for science excellence and international leadership that resulted in hundreds of papers and influential reports coming from the laboratory over the 18 years it existed. He provided me with a perfect environment for innovative and unfettered research but always with an underlying theme of benefit to the nation. Eddie was a believer that the way to compete in the international science arena was to provide researchers with the latest and best capital equipment and facilities for field and laboratory research.

He provided a strong voice for the need to consider land use as a cause of lake deterioration in New Zealand, at a time when point source discharges dominated the international literature on degrading water quality. In a book chapter¹ over 30 years ago he wrote “Intensified use of land, whether it be with farming, forestry or urban development, will inevitably lead to increased losses of nutrients to the waters draining into Lake Taupō”...and that “... the contribution from increased agricultural activity seems likely to pose the

greatest threat and it is here that future attention must be focussed”. This led eventually to Variation 5 (Lake Taupō Catchment) to the Waikato Regional Plan that set nutrient limits in the Taupō Catchment and was a forerunner of a considerable body of related catchment research now embedded in the Government’s freshwater reforms.

One of his most influential papers was a 1983 paper² “Lake eutrophication in New Zealand – a comparison with other countries of the Organisation for Economic Co-operation and Development” in which he provided evidence of nitrogen limitation in New Zealand lakes – almost a heresy in the era when phosphorus was believed to control the eutrophication process in the world’s lakes. In subsequent papers he demonstrated conclusively the need for consideration of nitrogen as well as phosphorus in limiting algal production in lakes – a legacy that continues today.

Oh, and one last point – until the day he retired in 1990 he always made the morning and afternoon tea for the Laboratory – in teapots. A Zip heater and teabags were not his style.

Clive Howard-Williams
CHIEF SCIENTIST
FRESHWATER AND ESTUARIES
NIWA ■

1. White, E, Forsyth, D.J. and Howard-Williams, C. (1983). Concluding perspective: the lake and man. pp.151–154 in: *Lake Taupō: Ecology of a New Zealand Lake*. DSIR Information Series 158, Wellington, 163p.

2. White, E. (1983) Lake eutrophication in New Zealand – a comparison with other countries of the Organisation for Economic Co-operation and Development. *NZ Journal of Marine and Freshwater Research* 17, 437–444.

- A) Family fun day at Nature Play in Christchurch.
- B) Checking out the native fish found in the Local Avon River.
- C) DOCs great new fish passage banner.
- D) Kōkopu Dave showing kids how inanga (whitebait) can use a fish pass to get over barriers.

INVITED ARTICLES & OPINION PIECES



Photo © Taryn Wilks



Photo © Sjaan Bowie



Photo © Taryn Wilks



Photo © Sjaan Bowie

Working Towards Improved Fish Passage Management in New Zealand

By Sjaan Bowie (DOC, Christchurch, sjaanbowie@doc.govt.nz)

A lot of progress has been made on better national coordination of fish passage management in New Zealand this year.

This began with **Trevor James** (Tasman District Council), **Sjaan Bowie** (DOC), **Anna Burrows** (Greater Wellington Regional Council) and **Paul Franklin** (NIWA) organising a two day national workshop on fish passage management in November 2013. Over 90 experts attended, with engineers and scientists from over 56 different organisations represented, including Regional and District Councils, DOC, NIWA, New Zealand Transport Authority, Kiwirail, Mahurangi Technical Institute, iwi and ecological and engineering consultancies.

The workshop focussed on providing updates, sharing experience and having discussions on fish passage management systems, the latest research, design standards and gaps in knowledge. Proceedings of the workshop were produced (Franklin *et. al.*, 2014) and these contain summaries of the papers presented and documentation of key discussions. Some of the key themes that emerged from the workshop were:

- A need to improve access to resources providing guidance on managing fish passage;
- The requirement for research to fill gaps in our knowledge about fish and their ability to pass different structures;
- The importance of installing fish passage solutions that meet best-practice designs; and
- The need for greater collaboration between ecologists and engineers to find effective solutions for enhancing fish passage at instream structures.

To help achieve these aims NIWA and DOC have recently agreed to work together to collate and develop national resources to support fish passage management in New Zealand. As part of this project, we have launched a new fish passage website with the aim of improving access to the most up-to-date information on what you can do to help our freshwater fish in New Zealand. You can also find copies of the presentations and proceedings from the 2013 Fish Passage Workshop at www.doc.govt.nz/fishpassage.

We have also established the national fish passage advisory group, which is a core group of ecologists, engineers and

environmental advisors that represent the key parties involved in fish passage management in New Zealand. The group aims to provide expert technical support, develop tools and national guidance to help enhance, maintain and improve the key constraints to fish passage¹ and connectivity² of waterways.

The role of the Advisory Group will include leading the development of national tools and systems, providing better national coordination, increasing accessibility to guidance and tools, coordinating an interdisciplinary approach to the management of fish passage, actively identifying and seeking collaborative opportunities to advance research and management, liaising with, and fostering support from industry bodies, professional organisations and special interest groups, and promoting development and influencing legislation and policy.

This year also saw the first World Fish Migration Day on 24th May 2014. World Fish Migration Day (WFMD) was a one day global initiative with local events worldwide, to create awareness and understanding of the importance of open rivers and migratory fish and their needs. More than 270 events were held in 52 countries, with five events around New Zealand, and Christchurch had the privilege of officially opening the global event.

Sjaan Bowie, **Dave West**, **Helen McCaughan** and **Alan McDonald** (DOC Christchurch) got together with Mike Hickford (Canterbury University), **Taryn Wilks** (Pattle Delamore Partners Limited), **Lan Pham** (Working Waters Trust), **Alex James** (EOS Ecology) and Environment Canterbury, Waihora Ellesmere Trust, ATS Environmental and CERA, to create a hands-on family event at Nature Play Park. **Joseph Hullen** (Ngāi Tahu and Canterbury Conservation Board) officially opened the event for the world, and Associate Minister for Conservation Nicky Wagner visited in the afternoon.

The day was a real success; packed with plenty of fun activities including videos, live fish displays, information stations, games, colouring in, lolly scrambles, practical demonstrations, guest speakers and a treasure hunt. A key highlight was “Kōkopu Dave” (Dave West) leading a practical demonstration of inanga whitebait trying to negotiate a makeshift fish pass.

-
1. Providing connectivity between all habitats necessary to complete freshwater fish and other instream organisms' lifecycles (e.g., aquatic invertebrates, shrimp).
 2. Scope covers all management of passage e.g., structures of all sizes, physico-chemical and hydrological. Connectivity, covers all freshwater fish and other organisms e.g., shrimps, aquatic invertebrates that need migration, connectivity and passage.

First Identification Keys to Freshwater Invertebrates of Campbell Island

By Shelley McMurtrie (EOS Ecology, Christchurch, shelley@eosecology.co.nz)

New Zealand's subantarctic islands are a UNESCO World Heritage site of unparalleled beauty and outstanding natural values. One of these islands—New Zealand's most southern landmass, Campbell Island—is home to several globally rare species including its unique and colourful megaherbs, and one of the largest colonies of royal albatross.

With an ever-increasing need to protect biodiversity values and understand how climate change will affect world ecosystems, the subantarctic region is assuming increasing significance. However, our knowledge and understanding of the extensive freshwater ecosystems (streams, lakes, and tarns) of these remote islands is limited.

The first identification keys to the freshwater invertebrates of Campbell Island, published online in July 2014 by EOS Ecology^{1,2}, goes some way to bridging that information gap. The key is just one of the outputs from a multi-disciplinary research expedition held as part of the Campbell Island Bicentennial Expedition (CIBE) in the summer of 2010/11, run by the 50^o South Trust.

The 235 freshwater invertebrate samples collected by the EOS research team during this expedition were used to develop two online identification keys covering the island's freshwater invertebrate fauna. Working with Professor Mike Winterbourn of University of Canterbury and taxonomists from around the world, we have been able to describe 36 taxa in the key and associated information sheets. This includes a new oligochaete species (*Macquaridrilus mcmurtrieae*) and new distribution records, with other possible new species pending confirmation via DNA work. The work is a significant improvement of our knowledge of the freshwater fauna of the island, with previous works having documented only 16 freshwater taxa.

Campbell Island's streams and tarns support only a moderately diverse range of aquatic taxa, but there is a high level of endemism. Some well-known groups such as mayflies (Ephemeroptera) are absent from the island, and caddisflies (Trichoptera) and stoneflies (Plecoptera) are poorly represented, being limited to one caddisfly and two stonefly species (one being semi-terrestrial). While the stoneflies are endemic to the island, the caddisfly (*Oxyethira albiceps*) is also widespread throughout New Zealand.

One of the most interesting features has been the discovery of an abundant and diverse fauna of aquatic oligochaetes (worms), belonging to the orders Tubificida and Enchytraeida (Class Clitellata). Oligochaetes were the third most abundant order in our freshwater samples, with almost 9000 individuals collected. With the help of Adrian Pinder (Department of Parks and Wildlife, Western Australia), we have only begun to fully elucidate this fascinating group and already they are proving to be one of the most diverse—to date seventeen different taxa (including several potential new species) have been identified from only a fraction (2%) of the total specimens collected. With the exception of *M. mcmurtrieae*, oligochaetes have not been fully identified in the key, but we hope to rectify this in later years, subject to funding.

The keys use Lucid software, which provide an interactive process of selecting features that match your specimen until the options are narrowed down to just one taxon. Associated information sheets are downloadable and include biogeographic information based on our samples collected during the CIBE. The key also serves to fill in previous information gaps on the poorly described aquatic taxa of the island, and should be a useful tool for practitioners working in the subantarctic. Understanding threatened ecosystems and the species they contain enables better conservation strategies to be implemented. ■

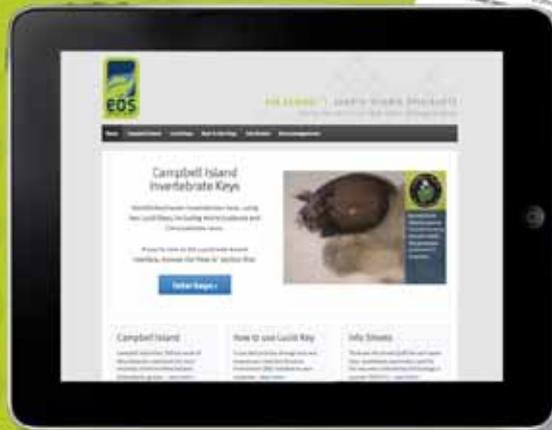
The key was made possible with funding support from the Terrestrial and Freshwater Biodiversity Information System (TFBIS) Programme (TFBIS No. 278). The TFBIS Programme is funded by the Government to help achieve goals of the New Zealand Biodiversity Strategy, and is administered by the Department of Conservation.

The key can be accessed at www.ciinvertkey.com.

Go to www.campbellisland.org.nz to find out more about the Campbell Island Bicentennial Expedition.

-
1. McMurtrie, S.A., Sinton, A.M.R., Winterbourn, M.J. 2014a. *Lucid Identification Key to the Freshwater Invertebrate Taxa of Campbell Island*. EOS Ecology, Christchurch. www.ciinvertkey.com.
 2. McMurtrie, S.A., Sinton, A.M.R., Winterbourn, M.J. 2014b. *Lucid Identification Key to the Freshwater Chironomidae of Campbell Island*. EOS Ecology, Christchurch. www.ciinvertkey.com.

Campbell Island Freshwater Invertebrate Keys



The Campbell Island invertebrate key includes two Lucid identification keys and downloadable information sheets for each taxa. They are found at www.ciinvertkey.com.

The tiny peat-lined headwater channel of Camp Stream is barely visible through the low vegetation, although the channel carved into the soft peat is over 1.5 m deep.



Photo © Shelley McMurtrie

Photo © Shelley McMurtrie



The beautiful cobble-lined Tucker Stream flowing through *Dracophyllum* dwarf 'forest' near to the old Coast watchers hut.

The streams of Campbell Island are surprisingly varied and support a range of different aquatic taxa that are now described in the new online keys.

Freshwater Conservation Under a Changing Climate: Preliminary Messages from the 2013 Climate Change Workshop

ISSUE

It is still largely unknown how climate change will influence freshwater ecosystems in New Zealand, and the Department of Conservation (DOC), as lead conservation agency, has an important role in identifying how freshwater biodiversity will respond to climate change and how we can best manage important ecosystems and species into the future.

INAUGURAL NZ WORKSHOP

A national workshop was seen as an effective way to bring together an interdisciplinary group of researchers, policy makers and managers to identify and address key issues with respect to climate change and freshwater conservation.

DOC organised a two day inter-agency meeting in Wellington, 10–11 December 2013, with 24 participants covering specialist fields of freshwater ecology, conservation, climate change, policy and Mātauranga Māori. The programme focused on “what are the issues?” on Day 1 and progressed to “what can we do?” on Day 2.

PRELIMINARY MESSAGES FROM THE WORKSHOP

Climate Predictions & Current Policy

- Warming of the climate is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia (IPCC Fifth Assessment Report, 2014).
- In New Zealand, changes in the hydrological dynamics of watersheds, sea-level rise, increased water temperature and altered land use patterns are predicted to occur. For example, eastern regions are likely to experience more droughts and low flows.
- The RMA (Section 7) and National Policy Statement for Freshwater Management have provisions for climate change – but there has been limited application for the conservation of freshwater biodiversity.

Vulnerability of Freshwater Ecosystems Due to Climate Change

- Rivers, lakes, estuaries and wetlands are all expected to be affected by climate change, and without action, local extinctions of freshwater species and shifts in distribution are predicted.
- The degree of impact will depend on geographic location (exposure) and the type of freshwater ecosystem (sensitivity).

- Sea level rise will lead to saltwater intruding further up rivers, altering whitebait spawning.
- Five (out of six) Ramsar wetlands of international importance are expected to change in ecological function and composition.
- No assessment on the vulnerability of freshwater conservation values due to climate change has occurred (unlike Australia and other countries).

Adapting Management & Policy for Freshwater Ecosystems

- DOC, Regional Councils and other agencies are applying strategic approaches to freshwater management, but few programmes adequately consider climate change.
- Investment decisions need to be informed by the expected changes in freshwater ecosystems as a result of climate change. For example, some lowland freshwater lagoons are predicted to transition to brackish estuaries that will have very different management requirements.
- Greater effort to reduce sediment and nutrient inflows, control invasive species and protect ecological flows will be required in many regions of New Zealand.
- Creating a network of freshwater protected areas that is able to adapt over time is critical.
- A framework to identify what management actions are necessary to maintain freshwater values under a changing climate was developed.

Science Needs: Informing a Climate Change Response

- There exists sufficient scientific consensus to implement a precautionary approach to freshwater management.
- Key knowledge gaps also remain – such as predictions of likely changes in wind events and subsequent impacts on the health of New Zealand lakes.
- Integration of climate predictions, species response models, Mātauranga Māori and conservation management scenarios is recommended.
- Stronger partnerships are required between policy makers and research agencies to ensure the most up to date information is used in resource management. For instance, new policy is based on future climate scenarios when setting limits to protect freshwater biodiversity.
- New Zealand application of tools developed by other countries will limit duplication of effort.

FEEDBACK

Participants represented a range of natural resource management agencies and research institutions. Following the workshop they commented on the importance of the meeting in addressing a significant gap in freshwater management. Other comments (from feedback forms) were “very informative and positive”, “good to get cross-sectorial knowledge in the aquatic area” and a “milestone workshop”.

NEXT STEPS

- Publish detailed information resulting from the workshop (2014).
- Improve linkages between natural resource management agencies and science institutions.
- Implement a collaborative programme to fill key knowledge gaps (e.g., map of ecosystems vulnerable to climate change).
- Revise our approach to ecosystem management, and priority setting, to consider the effects of climate change on freshwater conservation. ■

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EIANZ: Ecological Impact Assessment Guidelines for Use in New Zealand



Good decisions on the use of New Zealand's natural resources depend on acceptable assessments of impacts of existing and potential developments on New Zealand's environment. Ensuring a consistent level of assessment, with rigorous methods and relevant information, is a fundamental requirement of the resource management planning process. For members of the NZFSS this involves assessing impacts on freshwater ecosystems and the recommendation of suitable and relevant management that leads to acceptable environmental outcomes.

A team of ecologists, led by **Judith Roper-Lindsay**, **Ian Boothroyd** and **Mark Sanders**, is preparing a set of guidelines for carrying out ecological impact assessments (EcIA) in New Zealand. A small group of authors is working on an initial draft document which will undergo a period of peer review and consultation during 2014 and 2015. The aim is to finalise the EIANZ Guidelines by the middle of 2015.

The project arose in 2008–2009 when ecologists working on both sides of the Tasman identified problems with making consistent and rigorous ecological assessments in different environments, states, regions and districts; this in turn led to inconsistent decision-making in planning, and unsatisfactory outcomes for biodiversity. The draft EIANZ Guidelines issued in 2010 provide useful background on ecological considerations, however, the existing draft guidelines are not directly applicable under the Resource Management Act 1991, and are not specific enough to freshwater environments. The planned guidelines for New Zealand address New Zealand environments and legislation more specifically, as well as the outcomes of recent Court decisions on resource consent applications. They also introduce a section on ethics and practice, to assist ecologists to deal with the challenges of working to professional standards.

The EIANZ Guidelines will address issues around: professional ethics and conduct; project scoping, carrying out site work, assessing the significance of natural resources, assessing effects, managing impacts, monitoring, presentation of findings, and preparation of reports. Terrestrial and freshwater environments are being covered initially; guidelines for assessments in coastal marine areas may follow. It is intended that they will be used by a wide range of ecologists and planners in consultancy, local, regional and central government, research, and universities or colleges.

The guidelines are being prepared by ecologists for ecologists and will represent current best practice for those working in the applied field of impact assessment. There will be opportunities for NZFSS members to input or comment on the draft later in the year. ■

FOR FURTHER INFORMATION PLEASE CONTACT:

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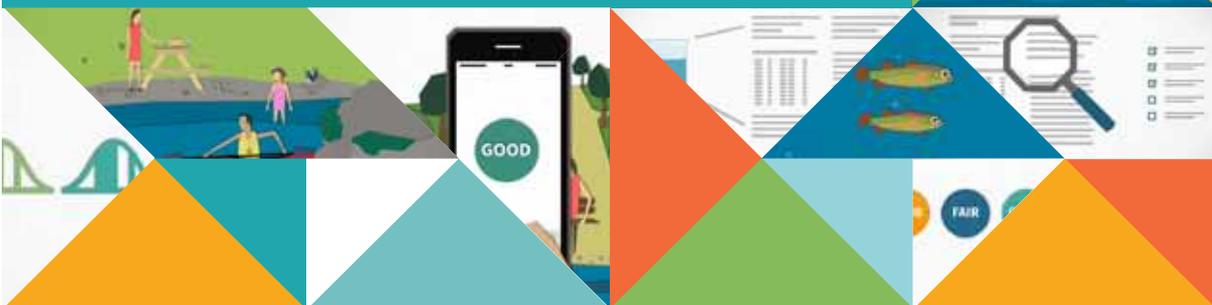
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Everyone in New Zealand has an interest in the quality of our freshwater. We each use on average 200 litres a day. It's home to around 70 species of freshwater fish, around half of which are threatened. It grows our food, it powers our businesses and we enjoy it in our leisure time.

There is a lot of information out there and a lot of research going on involving a lot of people. To share all this information in one place regional councils joined with the Cawthron Institute and the Ministry for the Environment and with the support of Massey University and the

Tindall Foundation developed LAWА — Land, Air, Water Aotearoa. LAWА displays the water quality data collected by regional councils at over 1100 sites around New Zealand. These are analysed by the council scientists and the Ministry for the Environment.



The Cawthron Institute checks the data has been collected, processed and analysed against best practice guidelines. Designers from Open Lab at Massey University packaged up the science into an easy to access, easy to understand format. LAWА helps you understand

what's happening in our waterways by connecting you with information about the quality of our water at a site, catchment, region and national level. You can discover how nutrients, phosphorus and bacteria affect a stretch of river or check out how suitable

certain spots are for swimming and other recreational activities. But it's not all about what we can tell you. You can use LAWА to report your own river observations, share news or let people know about river events in your region.

Visit LAWА to meet your rivers and share your stories.
LAWА – connecting you with New Zealand's rivers
www.lawa.org.nz

STUDENT NEWS



Kia ora fellow students,
I am Simon Stewart, your NZFSS student representative for 2015. I began a PhD at the University of Waikato in December 2013 investigating

the food web in Lake Taupō and its interactions with nitrogen cycling. Prior to that I did my undergrad and MSc at the University of Canterbury then worked for two years in the stable isotope laboratory at GNS Science in Wellington.

I'm new to this role and still finding my feet. However, I am really excited about the opportunity to be the advocate for the large body of students within the society. Students are in a pretty unique position in that we're learning and developing our future careers at a rapid rate; meanwhile we're the engine of research within universities. This, combined with the evolving, dynamic field of science careers, means that we're likely to face some novel challenges. Thus I would love to get

as much feedback and opinions from you as possible which I can take to the committee. Please feel free to get in touch with me at any time.

Some student events are in the pipeline for the upcoming Blenheim conference in November 2014 in which we can all meet up in an informal environment. More information on this will be coming in the near future. Again, if you have any suggestions for what you would like to see at the conference please send them through!

Looking forward to meeting many of you in Blenheim.

Simon Stewart
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CRITTER OF THE YEAR 2014

By Karen Shearer

The Ubiquitous Mayfly – *Deleatidium*

How can one of New Zealand's most commonly found freshwater invertebrates be promoted to the lofty heights of critter of the year? Read on...

Deleatidium was first described by the Reverend Alfred Edwin Eaton in 1899, who must have been a fisherman since *Deleatidium* is Greek for "a little bait". The flat bodies of the larvae allow them to hold on to stones in fast flowing streams. The leaf-like gills along the sides of their body are single – a bit different to other look-a-likes such as *Austroclima*, *Zephlebia* and *Mauilulus* whose gills are arranged in pairs. *Deleatidium* while the hours away grazing like sheep on cobblefields of algae and small detritus particles.

Like most mayflies, *Deleatidium* have forgone the contemplative pleasure of a pupal stage in their life cycle, opting instead for a very brief teenage (subimago) phase where they look like adults but are not sexually mature. The final and fully developed non-feeding adult stage (imago) is short and sweet as the adult life span is only 1–2 days – less if they're in the vicinity of a trout when emerging or dancing on the water surface whilst dropping eggs!

They are one of the more resilient of our invertebrate fauna inhabiting predominately cobble and gravel beds rivers, including those prone to flooding. And yet there is a sensitive side to *Deleatidium*, as an abundance of this mayfly at a site is taken as a sign of good water quality.

Deleatidium larvae are considered to be good crawlers but poor swimmers. Despite the swimming handicap they are commonly found drifting in the water column – great news for our drift-feeding fish! This mayfly (larvae and adult) is one of the most important foods of fish and riverine birds, and is a major food of predatory invertebrates. On a more personal note I haven't found them to be a culinary delight – an unfortunate taste test took place one evening after I failed to suppress a huge yawn while I had my head over a light trap.

There are more species of *Deleatidium* out there than you could poke a finger at (16 at least)! Just how important is *Deleatidium* to the New Zealand – look in the index of "New Zealand Stream Invertebrates" and there are 64 references to it – more than any other invertebrate in that book. In the bible ("Guide to aquatic insects of NZ") *Deleatidium* has 27 annotations attached to it. This animal is the rock star of New Zealand's rivers – everyone's talking about it.

Yes folks...dear ole' *Deleatidium* may be as common as muck, but where would our streams be without it! ■



Imitation *Deleatidium*



The real deal!

RESEARCH NEWS



UNIVERSITIES

University of Auckland



Research on Both Sides of the Planet

Kevin Simon has been busy finishing up a major project in the US while also starting new projects in New Zealand. He has been working with collaborators in the US on analysing data from two whole-watershed 15N tracer studies.

In New Zealand, **Emma Moffett** completed her MSc thesis focusing on urbanisation effects on stream nutrients and microbial nutrient limitation. Her work bridged Auckland and Christchurch, including looking at how earthquake disturbance interacts with urban effects. **Weimao Jheng** completed her MSc thesis in which she focused on the effects of the nitrification inhibitor dicyandiamide (DCD) on microbial function and nitrogen processing in streams. **Javiera Mulet-Bunder** recently finished a New Zealand-wide survey of littoral macroinvertebrates and zooplankton in pit lakes of active and abandoned mines for part of her MSc research—a collaborative project with Jon Harding (Canterbury University).

Two US-based students have been conducting research in New Zealand through East Asia and Pacific Summer Institute (EAPSI) programme sponsored by the U.S. National Science Foundation and the Royal Society. One of Kevin's PhD students, **Corianne Tatariw**, has been in Auckland working with Kevin and **Gavin Lear** on soil and stream microbial community structure and functional response to nitrogen

loading in dairy systems. **Dave Fryxell**, a PhD student at UC Santa Cruz, has been surveying populations of invasive fish in geothermal systems on the North Island. He, his advisor **Eric Palkovacs**, and Kevin are working on a joint project focusing on fish in these types of systems in New Zealand and the United States.

Back in the U.S.A. one of Kevin's American PhD students, **Thomas Parr**, recently defended his dissertation entitled 'Effect of urbanization on dissolved organic matter: composition, bioavailability and ecosystem health'. We have started applying Thomas' biogeochemical analyses to urban systems in New Zealand. Another PhD student, **Regina Rancatti**, is nearly ready to defend her dissertation focused on coupled biogeochemical cycling in watersheds subject to chronic nitrogen deposition. ■



The **Freshwater Ecology Group (FERG)** at the University of Canterbury, and part of the **Waterways Centre for Freshwater Management**, has had a busy year (and maybe a little preoccupation with furnishings):

Whole New Showroom: CAREX – The Canterbury Waterway Rehabilitation Experiment

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www.biol.canterbury.ac.nz/ferg/carex_introduction.shtml

What a busy year! The Freshwater Ecology Research Group (FERG) at the University of Canterbury kicked off its next phase in trialling in-stream rehabilitation tools to enhance riparian management practices. The Canterbury Waterway Rehabilitation EXperiment (CAREX) builds on a previous five years of smaller-scale trials and regional surveys that explored and quantified the effectiveness of existing riparian management with in-stream rehabilitation tools. New research team members, Dr. **Catherine Febria** (Postdoctoral Fellow) & **Hayley Stoddart** (Research Technician), joined Prof. **Angus McIntosh**, Prof. **Jon Harding** & **Maggie Bayfield**. The team has been busy in the field and lab generating pre-treatment baseline data across ten 1-km agricultural drains and waterways, most of which are on privately-owned agricultural land. The experiment is a stakeholder-driven process so we've also been busy building partnerships with the district councils & various committees, Environment Canterbury, Whakaora Te Waihora, Waihora Ellesmere Trust, DOC, Fonterra, Fish & Game and others to

ensure applicability of the CAREX findings to current and on-going decision-making, public education and understanding of ecosystem health. In the coming months, CAREX will kick off the first of the in-stream trials specifically for managing macrophytes, fine sediment accumulation and nitrate levels. The research sites are also proving to be effective demonstration sites, with public planting and education outreach events generating local interest around the aims of the research. Busy days are ahead for the team but overall exciting progress for CAREX and FERG. More to come soon! The research is funded by the Mackenzie Charitable Trust.

Old Furniture

Jon Harding has been MIA for the last six months and has been enjoying focussing on research (actually, on sabbatical). Recently, in collaboration with Kevin Simon & Javiera Bunder (Auckland University), he conducted a survey of active and abandoned mine pit lakes. Jon has also been continuing research on urban streams investigating food webs across a gradient of urbanisation in Christchurch. With **Nixie Boddy**, Jon has also been doing trials on the response of fish species to longer-term turbidity. Angus McIntosh (@gusmci) has been busy this year helping lead the CAREX project and continuing a wide range of other studies with various students and collaborators. These have included aquatic food-web work with students and on-going collaborations with **Pete McHugh**, **Phil Jellyman** and **Hamish Greig**, who have all moved on from Canterbury. A number of studies (described below) have also focused on the various influences of flows on native fish (brown mudfish, and bignose, longjaw and alpine galaxias) in association with NIWA's Sustainable Water Allocation Programme of research.



Photo © Robin Smith, DOC

Community planting event at a CAREX research site where nuisance hedge removal, bank re-shaping and widening of riparian buffer was carried out. Here members of the public participate in planting *Carex secta* and other plants along the water's edge.



Photo © Angus McIntosh

Richard White and Associate Professor Julian Olden, from the University of Washington, visit a brown mudfish (*Neochanna apoda*) tree hole pool in Saltwater Forest, South Westland.

Completely New Building(s)

Angus has also been involved in many exciting developments on the teaching and administration fronts at the University of Canterbury. Top of the list includes a large role in the design team for the new \$240 million Regional Science and Innovation Centre which will house a large proportion of the College of Science at Canterbury, including all new teaching facilities for the School of Biological Sciences and state-of-the-art laboratory facilities for the Waterways Centre for Freshwater Management. Jon Harding and Angus have also created a new Freshwater Science Field Skills (WATR203) which will run as a week-long summer field course for freshwater-orientated professionals and students.

Precious Antique Furniture

Mike Winterbourn is continuing his study of the life history and population dynamics of the estuarine snail *Potamopyrgus estuarinus*. A quantitative sampling program in the Ashley estuary indicates that population density varies little, seasonally. Mike is also examining gut contents of adult *Stenoperla* (Plecoptera) and also species composition and body size of these stoneflies on a latitudinal gradient in the North Island, using collections made by **Steve Pohe** last summer. It is anticipated this study will extend to the South Island in the coming summer.

Aging Furniture – Soon to be Sold

The following merchandise remains in our inventory. **Helen Warburton** has been working on analysing and interpreting data for her PhD thesis ('Body size, interaction strengths and food webs'), which she is in the process of writing up. Additionally she has taken on the challenge of lecturing the third year biology statistics course this semester. PhD student, **Amanda Klemmer**, has been working in collaboration with the FERG team on a large, long-term cattle tank experiment at the Cass field station. The project is looking at the effects of subsidies that enter food webs at different trophic levels on multiple food-web and ecosystem responses. **Mark Galatowitsch** has been finalising his PhD thesis on the dispersal patterns and flexibility of generalist invertebrate life-history strategies to sustain populations across a pond-permanence gradient.

New Apprentice Furniture

These FERG items are currently in production at our Canterbury workshop. Steve Pohe recently completed the first season of field-work for his PhD investigating the diversity, distribution and reproductive biology of New Zealand mayflies. This included an experiment testing the effectiveness of different wavelengths and strength of lights used to trap adult stages. He is now lost under Mt Ephemeroptera in the lab, where he is identifying specimens and recording body-size and fecundity measures. Steve, along with NorthTec colleagues **Lyn Wade** and **Olivier Ball**, has also been looking at stream invertebrate communities from Te Hauturu-o-Toi/Little Barrier Island Nature Reserve, following a visit to the island in January 2014. Nixie Boddy

has completed her work on how climate change related temperature increases will interact with introduced trout to produce highly spatially variable native fish distributions. She is now embarking on a PhD researching drying streams, including fish community resilience to habitat contraction, and the importance of configuration of refugia and drying reaches within catchments. **Sophie Hunt's** MSc research investigates effects of habitat and climate change on species interactions in lentic habitats. She has conducted a field survey looking at the distribution of native and exotic mosquitoes, and an experiment looking at the effects of habitat drying on predator-prey interactions. She is currently processing samples from the survey and analysing data from the experiment. **Tom Swan's** Masters thesis involves researching mosquitoes in Tonga. He has conducted a one month field survey looking at the distribution, oviposition, and the use of biological control agents for controlling larval populations. He is currently developing a pictorial identification key for mosquito larvae present in Tonga, a first of its kind for the country. **Roseanna Gamlen-Greene**, BSc(Hons) student, is currently researching current and historic marine subsidies (using stable isotopes and trace elements) from seabirds and seals to streams on the West Coast of NZ (Westland Petrels), Kaikōura (NZ fur seal pup freshwater nurseries), and Campbell Island and Banks Peninsula (historic seabird colonies). Recently she presented her research at an international conference on stable isotope ecology in Perth, Australia, which will hopefully lead to some collaborative projects in the future. Check out her research at roseannagamlen-greene.weebly.com. **Richard White** has recently begun his PhD investigating the influence of extreme flood and drought disturbances on freshwater fish population extinction dynamics and distribution. This work is in collaboration with Drs. **Doug Booker** at NIWA, and **Brendan Wintle** at Melbourne University, and supervised by Prof. Angus McIntosh.

Furniture for Sale

The following FERG merchandise is currently for sale. **Jon Bray** has recently submitted his PhD thesis on *D. geminata* ecology. He examined a number of aspects from habitat associations, to competition with other algae, to effects on algae and invertebrates, to the proximate and ultimate causes of bloom formation. He hopes to publish around 4–5 articles from the thesis, and chapters were written in publication format. He has three in review, and is working on another. Jon is currently writing and helping with the FERG – CAREX project, but will also be looking for work soon! Please don't hesitate to call him if opportunities arise: 027 333 1122. **Simon Howard** has very recently submitted his PhD thesis entitled 'Flow-related threats to rare galaxiids in the upper Waitaki River' from his research on upland longjaw and bignose galaxias in the Mackenzie Basin. **Tom Moore** recently submitted his Masters thesis investigating the effects of nitrate-nitrogen on Canterbury benthic invertebrate communities in late June. The results from his thesis will be presented during the Blenheim NZFSS conference.

Sold!

These FERG items have just been sold. **Emma Porter** recently completed her Masters thesis on Riparian Management: Investigating public perception and the effect of land-use, groundcover and rainfall on sediment retention. She has recently taken up a role as an Environmental Consultant at

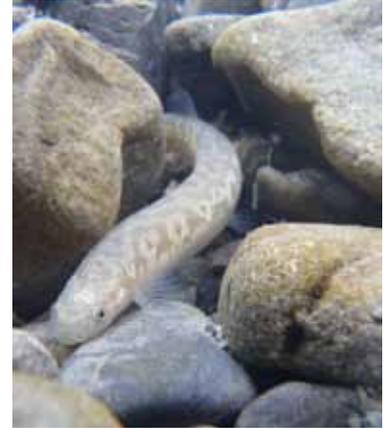
Synlait Milk Ltd, Canterbury focusing on developing Farm Environment Plans and working with farmers to comply with the Land and Water Regional Plan. **S. Elizabeth Graham** completed her PhD thesis, 'Mechanisms and mitigation of food-web change in stream ecosystems' earlier in the year and has moved to take up a position at NIWA in Hamilton. ■



Nixie Boddy nets a whopper trout as part of Tom Moore's MSc research.



Roseanna Gamlen-Greene sampling freshwater invertebrates at Ohau Stream, a nursery for juvenile seals.



Simon Howard has been investigating flow related threats to upland longjaw galaxias (*Galaxias prognathus*).

Massey University



Mike Joy has been touring the country giving talks as part of his Charles Fleming Award from the Royal Society on the demise of freshwaters, the science and the politics. He has been working on the externalities of agriculture in New Zealand and analysis trends in water quality data.

Holly Molesworth is doing a Masters, supervised by Mike Joy at Massey and **Bruno David** at Waikato Regional Council. She is working on timing and triggers of biota using the Lake Waikare fish pass, with an emphasis on shortfin and longfin eel population dynamics.

Masters student **Erin Broker** is looking at how in-stream barriers limit fish dispersal and the ability of diadromous fish to complete their lifecycles, supervised by Mike and **Ian Henderson**. She is testing the hypothesis that the vast majority of floodgates in New Zealand and worldwide could be altered to enhance connectivity, increase fauna passage and improve water quality. Her research aims to address this gap in knowledge by evaluating the effectiveness of fish friendly floodgates (FFGs), and to provide information to aid in the installation and design of future retrofits.

Russell Death is currently in the Institute for Advanced Studies as a Distinguished Visiting Fellow at the University of

Birmingham. He is working on applying machine learning to modelling linkages between the hydrology of English rivers and the invertebrates in them. From this it may be possible to model the effect that alterations in flow from climate change will have on the distribution of stream invertebrates in England. This is a collaboration with **Mark Ledger** and **David Hannah** (University of Birmingham) and **Mike Dunbar** (Environment Agency). Russell is also finishing off some work with **Ian Fuller** (Massey University) and **Mark Macklin** (University of Aberystwyth) on the effects of climate change on geomorphology – ecology interactions. He is collaborating with **Rachel Stubbington** (Nottingham Trent University) and **Cath Leigh** (IRSTEA) on a BBN for hyporheic invertebrate communities of the Midlands, UK. Russell is also working with his PhD student, **Adam Canning**, and Mark Ledger (University of Birmingham) on network stability analysis of food webs from Mark's experimental drought studies. Earlier in the year he was also pleasantly surprised to find that his modelling work on nutrients and MCI presented to the EPA Board of Inquiry for the Tukituki/Ruataniwha irrigation scheme formed the basis of their decision on nutrient management in relation to these resource consents.

Carolyn Burns and **Marc Schallenberg** continue their collaborative research with NIWA on aspects of lake restoration, including the use of biomanipulation as a potential means of improving lake water quality in New Zealand. Carolyn's description of a new, endemic species of *Daphnia* in New Zealand has been submitted for publication; the type material is registered and housed in the national museum of Te Papa, with paratypes in the Otago Museum, Dunedin.

Tina Bayer, now living in Uppsala, is writing up results of her PhD research on the effects of climate change on Lakes Wanaka and Wakatipu while employed part-time in computer modelling of some lakes in northern Sweden. **Beate Bierschenk** returned from a year's leave to complete the writing of her PhD thesis on the distribution, population dynamics, and locomotion of four species of mysid in the Taieri River estuary, and submitted it in June before returning to Germany. PhD student, **Amy Weaver**, who spent most of 2014 on parental leave, will return at the end of the year to complete her experimental work on the relative importance of new nutrients versus recycled ones in Lake Wanaka.

Gerry Closs is close to submitting the completed manuscript of the book 'Conservation of Freshwater Fishes' to Cambridge University Press, an edited volume he has been co-editing with **Julian Olden** and **Marty Krkosek**. Gerry is also working with **Peter Jones** to explore environmental determinants of egg size variation in *Galaxias vulgaris*. Gerry recently attended the Society for Conservation Biology (Oceania) meeting in Suva, Fiji where he enjoyed some tropical sun and established collaborative links for on-going research on the life histories of Indo-Pacific fishes. One of Gerry's collaborators, **Rune Knudsen**, visited Otago from August 2013 to July 2014 while on sabbatical leave from the University of Tromsø, Norway, and assisted with and co-supervised many projects.

Christoph Matthaei continues working on multiple stressors and other topics in freshwater ecosystems. His current research project investigating effects of the nitrification inhibitor DCD on streams and wetlands, which involves post-doc **Andreas Bruder**, PhD student **Romana Salis**, and collaborations with **Richard Storey** from NIWA and overseas scientists, is approaching completion with several journal articles in preparation. Some of the key findings will be presented at the NZFSS conference in Blenheim in November. **Colin Townsend** continues to publish papers with colleagues and students on topics related to the effects of land-use change, multiple stressors and climate change on stream ecosystems. **Jay Piggott** returned to Otago in late 2013 after an intense but productive year at the National University of Singapore to work as a research fellow

on multiple stressors together with Christoph and Colin. This year Jay also spent four months as a Visiting Research Scholar at Kyoto University. In February 2015, **David Buchwalter** from North Carolina State University will visit Otago for three months on a Fulbright scholarship to conduct collaborative research on multiple stressors using laboratory experiments.

Several students have completed their thesis research since the last report—**Rowan Moore** submitted his MSc thesis on 'Patch Use and Feeding by Redfin Bully'. **Sourav Paul** submitted his PhD thesis on 'Life history and distribution of mysids in estuaries of southern New Zealand: an eco-physiological approach'. He is currently working on sustainable development projects in India. **Michael Greer** submitted his PhD on 'The Effects of Macrophyte Control on Freshwater Fish Communities and Water Quality in New Zealand Streams', and is now working for Environment Canterbury. **Peter Jones** has submitted his PhD thesis on 'Interspecific life history variation in the *Galaxias vulgaris* complex: implications for interactions with invasive salmonids' and plans to return to the UK in November. **Javad Ramezani** submitted his PhD thesis entitled 'Intensive land use effects on fish communities and their invertebrate prey in Otago, New Zealand', and the final version of his thesis was accepted in July 2014. The first paper from Javad's thesis will appear in Freshwater Biology soon, and he's currently working on the second one. Javad returned to his native Iran where he is working in the National Center for Spatial Planning in Tehran. PhD student **Antje Bierschenk** submitted her thesis 'Influence of catchment land-use intensity on macroinvertebrates and ecosystem function along a freshwater-marine continuum' in June 2014. She returned to her home country Germany and is currently working on further publications based on her thesis. MSc student **Jon McCallum** completed his MSc thesis on didymo ('*Didymosphenia geminata* bloom formation in New Zealand's rivers') in January 2014 and has worked as an intern at Tasman District Council for several months since late 2013. He is currently on a writing grant preparing a publication from his thesis.

Aurelien Vivanços, co-supervised by **Cédric Tentelier** (UMR Ecobiop) in France, is in the final stages of completing his PhD which aims to investigate the social structure displayed by groups of drift-feeding fish using digital imaging techniques. This research has tested and developed tools allowing the quantification of free-ranging fish behaviour from fine scale, 3D spatial analysis. Aurelien's research is mainly focused on shoals of juvenile roundhead galaxiids (*Galaxias anomalus*), and his results suggest that they are able to display different social structures, depending of the environmental context they are living in. **Manna**

Warburton also intends to submit his PhD thesis on the ecology of torrentfish within the next four months—he recently returned to the USA with his family. Manna recently completed an analysis of torrentfish otoliths that indicates strong sorting of juvenile torrentfish returning from the sea by catchment. **Lance Dorsey** has also returned to the USA—he continues to work on his PhD research on brook charr. **Rasmus Gabrielsson** is also entering into the final stages of PhD thesis writing—he intends to submit his PhD on the salmonid migrations in the Clutha River catchment by the end of 2014. **Katha Lange** is working hard to submit her PhD thesis ('Multiple stressors in agricultural streams: interactions among farming intensity, water abstraction and ecosystem structure and function') by the end of August 2014. She will start a post-doc position at the EAWAG/ETH in Switzerland as soon as she completes her thesis, an exciting prospect, and hence the tight deadline.

Tanya Dann's PhD on the life history strategies of the NZ damselflies, *Austrolestes* and *Xanthocnemis*, continues to progress well, with convincing evidence for a fast-slow life history dichotomy accumulating. **Mahsa Toorchi** arrived from Iran to undertake a PhD in April 2014. She is examining

how large-scale landscape features interact with larval ecology to shape freshwater fish life history and distribution.

Jason Augspurger has also joined the group to undertake a PhD, arriving in June 2014 from the USA. Jason is working on amphidromous *Galaxias* and *Gobiomorphus*, and the role that larval ecology plays in determining the distribution of these fishes.

Bailey Lovett is busily writing up the results of her Honours research on the early ontogeny of *Paranephrops* crayfish. She is co-supervised by **John Hollows**, and her work demonstrated increasing temperature increases the rate of larval development significantly. **Matt Jarvis** is close to completing lab work for his MSc on larval drift in bluegill bully; the great majority of bluegill hatch and drift downstream to the sea in the two hours after sunset, suggesting scope to minimize losses by timing water abstraction to avoid the peak migration period. He presented the results of his work at the Society of Conservation Biology (Oceania) in Fiji in July 2014. **Hayden Hamilton** is just starting a MSc project on management of the North Otago whitebait fishery. ■

University of Waikato



Animals Move from Here to There

Ian Duggan continues his invasion and zooplankton research. Ian has recently published a paper with various collaborators on the first records of spread of the copepod *Skistodiaptomus pallidus* into natural lakes from constructed waters in New Zealand, which has seemingly occurred in association with the movement of fish; this work will continue with **Suzanne Branford** (MSc student) and with the help of **Martin Neale** (Auckland Council). He is continuing collaborations with **Ian Hogg** and **Carolyn Burns** (Otago) on the genetics of New Zealand zooplankton species. MSc student **Mahuru Robb** has recently handed in her thesis on the assessment of Cultural Health Indicators in wetlands.

Kevin moves from there to here

Kevin Collier moved to full-time at the University in February and has been managing the invasive fish work in the OBI, along with work in another MBIE programme looking at ways to incorporate mahinga kai values into freshwater management. He is working with **Natasha Grainger** (DOC) to develop an invasive fish management handbook due for publication in 2015, recent Waikato graduate **Mike Pingram** (now at Waikato Regional Council) to determine effects of pest fish management on shallow lake food webs, and **Bruno David** (Waikato Regional Council) to understand

environmental cues for koi carp spawning migrations in the lower Waikato. **Jeremy Garrett-Walker** recently handed in his MSc thesis on interactions between physical characteristics, macroinvertebrates, fish and waterfowl on constructed floodplain ponds where he found significant associations between invertebrates and some invasive fish in a study administered by Fish & Game. He is now assisting with the invasive fish work. **Alicia Catlin** is well into her MSc thesis looking at the emergence of zooplankton from floodplain soils following inundation, and potential links with nutrition of migrating whitebait. She has found that zooplankton hatch rapidly from dry soils during floods, with the types of zooplankton influenced by vegetation cover.

David Hamilton was recently invited to a workshop on the Great Lakes where several researchers from different institutions were using the ecological model ELCOM-CAEDYM as their primary tool for water quality predictions. David continues a close association with the model as he originated the development of the CAEDYM ecological model. Chris McBride has expanded his high-frequency lake monitoring buoy network and has recently included profiling capability for Lakes Waahi and Whangape (Waikato) and Lake Rotoehu (Bay of Plenty). As part of the Lake Biodiversity OBI (Outcome Based Investment), a data repository for lakes has been launched – see lernzdb.its.waikato.ac.nz. ■



GOVERNMENT ORGANISATIONS & CROWN RESEARCH INSTITUTES

Department of Conservation



Fish Passage

Sjaan Bowie worked in collaboration with a number of other NZFFS members to run a successful national fish passage management workshop, resulting in the production of workshop proceedings (Franklin *et al.*, 2013), a new fish passage website (www.doc.govt.nz/fishpassage), advocacy banner and MOU to work with NIWA (**Paul Franklin** and **Cindy Baker**) to collate and develop national resources to support fish passage management in New Zealand. A fantastic world fish migration day event was also held in Christchurch – see the short article ‘Working towards improved Fish Passage Management in New Zealand’ on page 9, also in the newsletter, for more information.

Sjaan continued her work with the multi-agency water intakes working party (Irrigation NZ, Fish and Game and Environment Canterbury (**Adrian Meredith**), and finalised findings from six field investigations of a range of water intakes in Canterbury to look at the key design criteria that best prevent entrainment and impingement of fish. Further work is planned with the Canterbury University Engineering Department to run experiments to specifically test design criteria in a hydrologic flume.

Freshwater Workshops & Wānanga

Sjaan and **Hugh Robertson** organised a workshop in December 2013 to discuss freshwater conservation under a changing climate. This workshop brought together an interdisciplinary group of researchers, policy makers and managers to identify and address key issues with respect to climate change and freshwater conservation. A summary has been developed and is available on the DOC website (Robertson & Bowie 2014), and proceedings of the workshop are currently being drafted.

Bowie *et al.*, 2013 reported the findings of the freshwater fish taxonomic workshop, which included identifying ways of assessing a species status and the key actions required to determine the taxonomic status of our indeterminate taxa, focusing on non-migratory galaxiids.

A **freshwater wānanga** put together by DOC Whanganui staff in collaboration with, and warmly hosted by, iwi and hapū on Whangaehu Marae (just south of Whanganui) was a great success. It provided a wonderful exchange of



Ben Potaka (black singlet) shares his knowledge on tuna ecology and trapping techniques on one of the many fieldtrips of the freshwater wānanga held at Whangaehu Marae.

mātauranga and western science, focussed on collaboratively protecting our freshwater taonga. Thanks to all those who generously shared their knowledge from the iwi and hapū, Horizons, DOC freshwater team, Ian Kusabs, Landcare Research and Massey University.

Threatened Species Conservation

Jane Goodman and **Natasha Grainger** led the re-ranking exercise of freshwater fish and invertebrate species respectively. The conservation status of all known New Zealand freshwater fish and invertebrate taxa was assessed using the New Zealand Threat Classification System (NZTCS) criteria. **Nicholas Dunn** and **Pete Ravenscroft** contributed their expertise to the freshwater fish assessment process and were panel members.

Amber McEwan worked with Jane, Sjaan and Natasha Petrove to undertake a review of the three freshwater fish recovery groups and plans. The outcomes from this review will be used to guide future management of freshwater fish.

Martin Rutledge has continued to have a focus on assessing flow related impacts on freshwater systems—most recently in Otago to help with review of abstractions issued under the mining privileges regime.

Similarly, Nicholas Dunn has spent much of the year involved with RMA applications looking at flows, nutrients, gravel, and fish habitat protection; and researching the habitat requirements of non-migratory galaxias. However,



Intrepid Otago galaxias gatherers – Martin and Nicholas

he has still managed to get into the field, with highlights being finding new sub-populations of Gollum galaxias in the Eglinton River in Fiordland National Park, and Canterbury mudfish in a previously unsurveyed spring fed stream in the Selwyn River catchment. He has also been involved in resolving the taxonomy of the *Galaxias vulgaris* species complex, along with **Shannan Crow** (NIWA), and **Jon Waters** and **Graham Wallis** (University of Otago), with the view to describing several new species. And he's also looking at the morphology of alpine galaxias to help determine the taxonomy of this group, with specimens collected in Canterbury, Otago, and Southland.

Sjaan and **Dave West** worked with **Francis Charters** and **Aisling O'Sullivan** (from Canterbury University's Engineering Department) to collate knowledge on the use of built barriers to protect native values. This included undertaking a literature review, creating a database of barriers and collating guidance on design and effectiveness of structures for future use. In 2013, Francis prepared a report on this work for DOC called 'Waterway barrier design for protection of native aquatic values'.

In between assessing RMA consent applications, and co-ordinating development guidance material to help DOC staff with assessing the freshwater impacts of consent applications, **Natasha Petrove** worked with **Anna Paltridge** to develop some brochures to raise the profile of mudfish and their habitat—with input from other DOC staff from around the country. So far, two brochures have been produced: one about brown mudfish, and a second on Northland/burgundy mudfish—check them out on the DOC website: www.doc.govt.nz/mudfish (links to pdfs of the brochures can be found on each of the species' pages). These brochures are the first part of a project to provide guidance on habitat restoration for mudfish: step two will be developing a step by step guide on how to restore habitat for mudfish.

Following the PCE report on longfin eel, DOC completed a review of the various policy and legal tools that they could explore further—Dave West provided an overview of eel habitat issues for the independent eel panel and has overseen some work on spatial extent of possible protection areas. In relation to some of our other native species, Dave found the exchange between diverse people during the whitebait special session at last year's conference particularly valuable, and was

buoyed by a consistent desire to improve things for our iconic whitebait. On a different note, being a member of the Invasive Animal CRC Inland Waters Pest Products and Strategies Steering Group and LERNZ External Science Review Committee has given Dave an opportunity to benefit from the innovative research about developing tools for controlling pest fish and restoring lakes.

Freshwater Tier 1 Pilot

Dave, **Michael Pingram**, and **Helen McCaughan**, together with other Freshwater Team members, worked with local DOC and Northland Regional Council staff, and consultants to run a pilot wetland, river and lake biodiversity monitoring project in Northland. Nineteen wetlands (25 monitoring sites), twelve river sites, and three lakes were sampled using a combination of existing monitoring methods. The results will inform design and costing of a national freshwater biodiversity monitoring program as part of DOC's Tier One national monitoring program.



Photo © Dave West

Waitangi endowment forest wetland plot, Kerry Bodman (NIWA) & Andrew Townsend (DOC) pictured.



Photo © Dave West

Te Rewa Stream from downstream end of a sampled 150 m reach.



Photo © Natasha Grainger

Lake Ngatu (on a good day!).

Work with Others

Martin Rutledge and Jane Goodman, along with other DOC staff, worked with Project Janszoon and School Teachers in the Abel Tasman National Park to provide them with advice on how to engage school children with freshwater biodiversity values. Electrofishing and spotlighting demonstrations, and feeding the eels in Totaranui Stream were mentioned as some of the highlights of the weekend retreat.

As well as being involved in several of the other projects already reported (wetland monitoring in Northland as part of the Tier 1 pilot, the Freshwater Wānanga), **Philippe Gerbeaux** has otherwise been kept busy providing advice on a range of RMA matters around the country. As a co-author with **Fleur Maseyk** (The Catalyst Group), he has written up a summary of learnings from two major RMA cases (West Coast Land and Water Plan, and the Horizons One Plan) on the assessment of significant habitats—to be published soon as a Forum Article in the NZ Journal of Ecology. Philippe coordinates the scientific and technical freshwater advice under the DOC/Fonterra partnership, is an active member of the DOC's Natural Capital technical group, and is engaged with Terry Hume (NIWA) to develop a NZ Coastal Hydrosystems typology—a complement to his previous work on a NZ wetland typology (a draft of the proposed approach was presented at the November 2013 NZ Coastal Society conference). Finally, with the assistance of Jane Goodman (as a volunteer), Philippe travelled to Samoa in July to lead the freshwater survey component of a project for the Integration of Climate Change Risks and Resilience into Forestry Management in Samoa (ICCRIFS), funded by the Samoan Ministry of Natural Resources and Environment (MNRE). The Department of Conservation has an agreement with Pacific countries to provide and exchange specialist advice and support. The project, managed by Conservation International, was carried out on the two main islands of Upolu and Savaii covering 26 villages as main stakeholders. Baseline information was collected on ecosystems and species in the context of current climate condition. It is anticipated these surveys will make an important contribution towards the conservation and management by providing critical biodiversity data that will assist in determining and prioritizing specific areas for management.

Arawai Kākāriki, Whangamarino Wetland

Shay Dean and **Lucy Roberts** have been updating their Whangamarino Wetland vegetation maps with high resolution aerial photography. They are starting to build up a picture of how mānuka is expanding into the peat lands. Evaluation of the water regime, nutrient and sediment management scenarios for the wetland is assisting with building a picture of the possibilities of mitigating the effects of the Waikato Regional Council's Flood Control Scheme. River bed profile surveys are happening to assess rates of sediment accumulation occurring in the main channels of the wetland.

The team has also been busy with restoration planting of retired grazing concessions, ongoing weed management and red deer survey and control, controlled burning and monitoring for management of the swamp helmet orchid



Teachers interact with large 'tame' longfins as part of the freshwater experience at Totaranui.



The group after the electric fishing demo, which showed a good variety of native fish, including lamprey ammocoetes.



Philippe & Jane with students of a local Samoan school learning about their native freshwater fish and crustaceans.

(*Corybas carsei*), predator trapping to enhance populations of native wetland birds (e.g., Australasian bittern) and research to improve methods for controlling mammalian predators in wetlands (led by DOC scientist **Craig Gillies**). Some other work around the wetland includes research by Landcare Research, NIWA and **James Griffiths** (DOC) aimed at improving techniques for willow control in wetlands, and work with **Collin O'Donnell** (DOC) and Massey University PhD student **Emma Williams** to improve methods for monitoring cryptic wetland birds.

For more information about the Arawai Kakāriki wetland programme, check out www.doc.govt.nz/conservation/land-and-freshwater/wetlands/arawai-kakariki-wetland-restoration/

National DOC Freshwater Team

Michael Pingram graduated with his PhD and finished some significant RMA projects before taking up a freshwater scientist role at Waikato Regional Council. **Emily Funnell** returned from maternity leave, and Anna Paltridge is expected back from maternity leave in April 2015. Helen McCaughan is filling in for Anna while she's away.

Ben Woodward has just joined the team – he has recently submitted his PhD thesis which investigated the exchanges of carbon and nitrogen between terrestrial and aquatic ecosystems in lowland, flow-regulated Australian rivers, and prior to starting work at DOC was working at AgResearch on reducing nutrient losses from pastoral farming in New Zealand.



Photo © Mary Beech

Whangamarino wetland

Christchurch

Doug Booker and several NIWA colleagues are working on a year-long project funded by the Ministry for the Environment to develop a national-level pressure-state-impact model for freshwater flows. The model will provide estimates of the state of freshwater flow regimes throughout New Zealand, the pressures on those flows, and their impacts on both the environment and the supply of freshwater for out-of-stream use.

Michelle Greenwood and Doug have continued investigating the influence of recent river flows on both larval aquatic invertebrate communities, and their capacity to export adult aquatic insects. Michelle is also working with **Cathy Kilroy** to set up an experimental channel array for use in investigating the potential impacts of proposed NOF guideline levels for nutrients and algae on stream communities. Michelle, Doug, **John Stark** (Stark Environmental) and **Joanne Clapcott** (Cawthron Institute) have been awarded Envirolink funding to update and provide new MCI tolerance scores for freshwater invertebrate taxa.

Scott Larned has spent most of the year on secondment to the Nature Conservancy in Hawaii. Scott is helping the Nature Conservancy expand their marine science programme to include water quality monitoring and management of algal blooms, eutrophication and biotic invasions. Part of the year was also devoted to working on surface water-groundwater interactions research projects with a group of British, German, American, Dutch, Spanish, French and Italian scientists. Our research group has been funded by the Leverhulme Foundation to run field studies in Germany, Britain, Spain and the US, with the general aim of greater understanding of the physical controls on hyporheic chemistry and ecology. Our first study took place at the Selke River in Germany—it was a bit chaotic, but it produced a big and diverse dataset. When not working on Hawaiian issues and German streams, Scott has been editing a special issue of *Freshwater Science* focused on surface water-groundwater research, and working on river monitoring projects with NIWA colleagues. He is also supposed to be working on several chapters of the upcoming *Advances in Freshwaters* book, but time is racing by...

Don Jellyman has retired but works part-time at NIWA as an emeritus freshwater scientist. He is mainly occupied in writing up a number of papers on eel ecology and has recently completed a population study of eels in a small lake in Christchurch—the objective of this was to investigate alternative means of estimating populations other than by a classical mark-recapture study. He is also involved with **Cindy Baker** (NIWA, Hamilton) in tagging and tracking

adult lamprey in the Okuti Stream, Banks Peninsula—last year lamprey nests were found, the first time in the southern hemisphere for *Geotria*.

Hamilton

Aslan Wright-Stow has continued working on the long-term impacts of exotic forestry harvesting on streams in the Coromandel with John Quinn. Aslan, John and **Paul Franklin** have also continued to monitor tree fern additions at two agricultural streams in Whatawhata to determine if they enhance the complexity of stream morphology, flow paths, and increase natural retention of organic matter, thus improving habitat quality for invertebrates and fish. Aslan, **David Reid** and **Steph Parkyn** are writing up their re-survey work on nine Waikato riparian buffer zone planting schemes to determine whether downstream riparian buffer zones enhance pasture stream restoration within an agricultural landscape. This work complements functional indicator work on the same streams by **Roger Young** and **Kati Doeiring** from Cawthron. Additionally, Aslan, **Richard Storey** and **Rob Davies-Colley** are working with 12 community groups from throughout the country in a study to determine stream health monitoring concordance with results obtained by regional councils sampled on the same stream at the same time. Aslan is also leading a TFBIS funded project developing new and innovative identification keys to the SHMAK indicator invertebrates. These will include dichotomous and web based keys, live video, and rein mounted specimens. Aslan has also continued to work on a range of marine and lakes projects in his capacity as a scientific diver.

Max Gibbs has been working on the restoration of Te Arawa/Rotorua lakes with the Bay of Plenty Regional Council, both on their Technical Advisory Group and in the field, assessing the efficacy of P-sequestration materials, sediment P release processes and the efficacy of the experimental aerators in Lake Rotoehu. He has also been working on the restoration of Lake Horowhenua for Horizons Regional Council. Together with John Quinn, he developed a restoration plan for the lake which was adopted by the Lake Horowhenua Trust Board and has been used as the basis for establishing the Lake Horowhenua Accord, signed in August 2013. The restoration plan was also used as the basis for a successful Freshwater Clean-up Fund application from MfE. Max has just completed two studies investigating factors influencing chlorophyll a concentrations in the Waikato River. The first focused on nutrient limitation and zooplankton grazing effects for Waikato Regional Council, and the second assessed effects of retention time and thermal stratification in the hydro lakes for Dairy NZ.

John Quinn continued to lead the Aquatic Rehabilitation MSI programme and research on in-stream nutrient attenuation in the Cumulative Effects programme. The nutrient work has focused on the Tukituki River and its macrophyte dominated Papanui Stream tributary, and has included investigation of the roles in nutrient attenuation of insect emergence (with **Brian Smith**) and fine streambed sediment (in collaboration with **Rich McDowell**, AgResearch). John ran a workshop at Whatawhata for rural professionals on the longterm ICM experiment (since 1995) with **Mike Dodd** (AgResearch), with Waikato RC support. A paper on the water quality results from the first seven years post ICM changes with **Andrew Hughes** and **Lucy McKergow** is in review. John led the writing of the Land and Water Management theme of the Our Land and Water National Science Challenge, contributed to the Our Biological Heritage NSC, had input to the NOF periphyton panel, and began on the Technical Leadership Group of the Waikato Healthy Rivers Plan Change project.

The NIWA Hamilton Ecotox team (**Sue Clearwater**, **Chris Hickey**, **Karen Thompson** & Anthea Albert) continued their work on freshwater mussels (kākahi/kāeo), examining the

tolerance of kākahi larvae (glochidia) to ammonia, nitrate and pesticides, and attempting to culture them in vitro with the help of a Thai graduate student, **Aom Sangsawang**. They also brought berried female kōura into the lab and collected the newly released juveniles to examine their tolerance to ammonia, low dissolved oxygen and high temperatures. These stressor tolerance data inform ongoing development of ANZECC and NOF guidelines. In a project funded by the Waikato River Authority (WRA 13-018) a dive survey was completed (by Sue, Rod Budd, Dave Bremner & Scott Edhouse) for kōura in deep regions of the upper Waikato River, from Huka Falls through three hydro lakes to Atiamuri Dam. The dive survey was complemented by deployment of tau kōura traps (**Ian Kusabs**, Sue & **Eddie Bowman**) and confirmed initial findings that kōura populations have declined significantly since the last surveys were completed in the mid 1990s.

Mike Stewart and **Chris Hickey** have been assessing the influence of bioturbation on the efficacy of a number of lake phosphorus sediment capping agents. Kōura were housed in an experimental mesocosm set up to mimic a lake environment and allowed to disturb the sediment/capping



Photo © John Quinn

Brian Smith with his array of insect emergence traps used in nutrient attenuation studies on the Tukituki River, February 2014.

agent layer. After this time, the kōura were removed and the efficacy of the capping agents in preventing phosphorus release was assessed under induced anoxic conditions. Unexpected results have led to follow-up experiments, assessing both pH and mechanical mixing effects of capping agent efficacy.

Work by **Paul Franklin, Cindy Baker** and the rest of the fish team in Hamilton resulted in the discovery of giant kōkopu spawning sites for the first time last year. This year they have built on that initial discovery by hunting down further spawning locations and beginning to develop an understanding of the important role that flow and riparian management play in controlling large galaxiid spawning success. State-of-the-art PIT telemetry methods have been a key tool for tracking fish movements within and between streams in the Hamilton City area.

Paul Franklin worked with Sjaan Bowie (DOC), Trevor James (Tasman DC) and Anna Burrows (then of GWRC) to convene a two-day national fish passage workshop in Wellington in November 2013. Cindy Baker and Paul both contributed presentations to the workshop covering latest developments in fish passage research. Proceedings of the workshop and copies of the presentations are available on the DOC website: www.doc.govt.nz/fishpassage. NIWA have subsequently signed an MOU with DOC to collaborate on developing national resources for fish passage management. This agreement will also see the establishment of a new multi-agency national fish passage advisory group to be co-ordinated by Paul and Sjaan.

Cindy Baker, Paul Franklin and **Cheri Van Schravendijk-Goodman** (Waikato Raupatu River Trust) have continued their work with iwi in the lower Waikato River catchment to identify opportunities for restoring whitebait habitat as part of their Waikato River Authority funded restoration programme. A key focus this year has been improving knowledge of inanga spawning sites in the lower river and undertaking assessments of possible fish migration barriers.

Brian Smith has been busy with **Richard Storey** investigating the secret lives of adult aquatic insects. They are continuing to explore where female aquatic insects are laying their eggs. Last summer was spent covering emergent rocks in Tanglefoot (a weatherproof glue-like substance) and making supersized sticky traps. They are coming up with some very interesting results, and more questions than answers! In July, Brian ran the first ever adult caddisfly identification workshop. He plans to run another on Tuesday 28th April 2015 (see the NIWA website for details).

Kerry Bodmin (NIWA) led the Landcare/NIWA wetland research team to re-measure plots in Whangamarino Wetland two years after grey willow were aerially sprayed with glyphosate. Support from DOC in this project has been instrumental. Treated plots show recovery of understorey plant cover, particularly the sedges. Kerry also received a NIWA training award and had 8 weeks in the United States attending a wetland delineation course, working with wetland staff from USGS and attended the inaugural Joint Aquatic Sciences Meeting in Portland, Oregon.



Diving in upper Lake Ohakuri on the hunt for kōura. Underwater scooters help divers negotiate high water flows (NIWA funded by Waikato River Authority WRA 13–018).



Rebecca Moss (USGS) and Kerry Bodmin (NIWA) undertaking field work in Savannah River swamps, Georgia, USA.

NON-GOVERNMENTAL ORGANISATIONS

Fish & Game New Zealand



New Zealand Council

Fish and Game remains intimately involved with water resource management policy development nationally, such as the Land and Water Forum and the subsequent freshwater National Policy Statement. Over the last few years Fish and Game has also played a large role in the development of new generation regional plans which include the Horizons One Plan, proposed Canterbury Land and Water Regional Plan, and Hawke's Bay's Tukituki plan. Fish and Game has brought together a team of leading economists, planners, agricultural consultants, modelers, and freshwater ecologists. Fish and Game is working to ensure that these new generation regional plans recognize the link between water quality outcomes and land use management, set robust environmental bottom lines which protect ecosystem health, and ensure that agricultural and horticultural activities are managed under a regulatory framework to ensure that current and future land use is sustainable and achieves water quality and ecosystem health outcomes.

Of particular relevance to the scientific community is the current debate around whether or not nitrogen should be managed for ecosystem health, or just short of toxicity. Fish and Game was a primary submitter on the Ruataniwha project which was heard by a Board of Inquiry in late 2013. Based on the Fish and Game case, which was consistent with the New Zealand Freshwater Sciences Society's submission on the National Objectives Framework, that Board has ruled that both nitrogen and phosphorus limits should be set in the Tukituki Regional plan to protect ecosystem health, and that these would be defined to achieve suitable outcomes for macroinvertebrate communities at the maximum permissible concentration to provide for healthy macroinvertebrate communities. It is of concern that the government did not review its proposed changes to the National Policy Statement in the light of the outcome of this case.

Fish and Game staff had a rare national staff conference in Rotorua in July, enjoying three days of discussion and debate with stimulating speakers from North America on wildlife management and from various speakers on sustainable farming practices and perceptions of Fish and Game in the community

Northland Region

Rudi Hoetjes advises that Northland has been hit with a very wet winter, emphasising the debate over management of the Hikurangi swamp and upper catchment, which is now the subject of a Department of Conservation-led investigation into biodiversity opportunities. **Nathan Burkepile** is proposing to run wetland wildlife management workshops with his North American colleagues.

Auckland Waikato Region

A major effort by **David Klee** in the last year has been detailed investigations of mallard breeding success using radiotracking techniques. This programme is to be extended to Southland region for the upcoming season.

Implementation of the joint management of the Waikato River settlement has provided some opportunities for resourcing of some wetland management projects. Concerns about land use conversion of south Waikato pine forests into dairying remain live issues.

Eastern Region

Eastern Region Fish & Game have been actively involved over the past year in assessing the results of changes to the hatchery stocking program to the Rotorua lakes. This has been done through a series of intensive angler creel surveys, utilisation of fish traps and the 'data watch tag' return program.

Changes to liberations involved moving from traditional one-off seasonal liberations to releases that are spread out over a wider time frame. Survival of yearling trout is expected to increase by avoiding poorer growth conditions around winter, leading to greater benefit by anglers. The first phase of this program began in spring 2012. Data from the first cohort (through to three years of age) has produced some interesting findings and several more years of data will help staff fine-tune releases.

Eastern Region Fish & Game, with support from Genesis Energy and HBRC have been involved with re-establishing the Lake Waikaremoana Water Quality Monitoring Buoy following one of the moorings being sabotaged. HBRC are funding a new deep dissolved oxygen meter which will be installed during

late winter 2014. The buoy has been in the lake gathering temperature, light, algae and turbidity parameters for 4 years. A report has been generated combining environmental data and lake level records with fishery statistics to examine key drivers for the Waikaremoana fishery.

Along with Genesis Energy and the Lake Waikaremoana Hapū Restoration Trust (LWHRT), Fish & Game are operating a fish trap over the 2014 winter in the Waiotukupuna Stream, a tributary of Lake Waikaremoana. The goal is to monitor the brown trout spawning run to assess any effects of the lake's hydro manipulation on the fishery, which will more likely be seen in the brown trout which inhabit the littoral areas.

Eastern Region hatchery staff remain committed to investigating enhanced and more efficient ova incubator methods. Being able to implement strategies that reduce harmful chemicals, or lowering labour intensive practices such as egg 'picking' would prove hugely beneficial.

Several key spawning tributaries have been studied using a combination of fish trapping, drift diving and electric-fishing methods. These ongoing projects are being used to provide baseline data to monitor spawning success and investigate whether enhancement of these waterways is required in the future, given catchment development or natural erosion.

Hawke's Bay Region

Involvement in the Ruataniwha case to ensure that water quality limits were appropriately set to safeguard life-supporting capacity remains a key effort by Hawke's Bay Fish and Game.

Nelson Marlborough Region

A major effort by Fish and Game regionally in the last year has been willow control in the Para Swamp, which lies beside SH1 just south of Picton, with major support from the NZ Gamebird Habitat Trust and minor support from the Ministry for the Environment and DOC. This is to improve wildlife habitat and hunting opportunities and has been largely undertaken by **Vaughan Lynn** and **Rhys Barrier**. The follow-up included ground control of willows which escaped the original aerial weed control, with some minor earthworks for water level control during low rainfall periods.

A major effort has been put into preparations for a water supply reservoir in the Waimea River catchment, which has involved a community initiative including water users, local authorities, iwi, DOC, and Fish and Game. The Waimea plains have suffered shortages and cut backs for water users and the Waimea River has been dried up several times in the



Aerial and boat spraying of willows in the Para Swamp, Marlborough.

past decade as the water allocated is more than ten times the current minimum flow. Consents for the reservoir have been applied for, which would provide minimum flows in the river of 1100 l/sec rather than the current nominal 225 l/sec.

Otago Region

Lindis River PIT Tag Study: Fish & Game, in conjunction with Otago University, the Clutha Fisheries Trust, and Cawthron Institute, have started a two year study of juvenile trout movement and mortality in the Lindis River. This stream is heavily impacted by abstraction for irrigation and experiences low flow events on an almost annual basis.

The study aims to track movements and examine mortality of juvenile trout over summer and autumn using Passive Integrated Transponder (PIT) tags. These are about the size of a grain of rice, and were implanted into 620 juvenile trout in late December 2013. Tagged fish were then monitored using mobile PIT tag readers, and stationary readers positioned on an irrigation raceway and river main-stem. River levels dropped significantly within one week of tagging; meaning that fish movements were restricted and juvenile trout (and upland bullies) experienced high levels of mortality, including predation and scavenging.

The main field trials will begin summer 2015 and it is anticipated that results will have relevance to other heavily abstracted rivers, and be useful for informing the minimum flow setting process. Please contact **Morgan Trotter** m.trotter@fish-game for more information.

Southland Region

Drift Diving: We completed most of our proposed work this year with counts in the Upper Oreti, Mataura, Waiau, Aparima, and Mararoa. We now have a long term data set

of estimates of the population of trout in these rivers. In summary, since about 1990 trout numbers have increased from about 5/km to about 20/km in the upper Oreti, and from 10/km to about 30/km in the Upper Mataura. In the mid reaches of the Aparima, counts have varied from 40–80 per km with no distinct trend. In the Upper Waiau over the past ten years the numbers fluctuate from about 300–400 per km, again with no trend. But in the Mararoa middle reaches, which have been affected by didymo, the numbers have declined from about 30 to 10 per km. In the lower Waiau, where didymo is also abundant, trout numbers have declined from about 250/km before 2004 (when didymo was discovered) to about 70–100/km post-didymo discovery.

Fyke Netting: A local commercial eel fisherman has provided us with data relating to the numbers and sizes of trout he has caught (and released) in his fyke nets in the Aparima, Makarewa, Oreti, Mataura and Waiau Rivers. Over the past three years he has caught over 6000 trout. He has a catch rate which ranges from 0.5 to 2.5 trout per net night with the highest catch rates recorded from the Makarewa and the Aparima Rivers. The most productive nights have been those when there has been a moderate increase in the flow in the river. The fish have been put into four size classes. The Makarewa has the greatest abundance of small (25–40 cm) fish, while the Aparima has larger fish (40–60 cm).

Cumulative Effects Survey: We have been working with the Cawthron Institute in a nationwide survey on cumulative effects. We have completed surveys on the Waimea, Waimatuku, Irthing, Otamita and Tussock Creeks, as part of Cawthron's Cumulative Effects programme, which is intended to determine the critical habitat factors that allow trout to thrive in small to medium sized streams in New Zealand. This project has two more years to go before it is completed. ■



Rick Boyd (Upper Clutha Anglers) and Morgan Trotter (Otago Fish and Game) searching for PIT tagged trout in the Manuherikia River.

COUNCILS & UNITARY AUTHORITIES

Auckland Council



Te Muri Regional Park – Land management & Stream Restoration

This project aims to quantitatively assess the environmental and economic effects of applying 'sustainable land management practices' on a working sheep and beef farm. The project is being carried out on a 35ha sub-catchment of the Te Muri Stream, in the Te Muri Regional Park. Following collection of baseline data, more sustainable farming practices will be established (e.g., fencing regimes, pasture and livestock management), and the changes in key environmental values and economic performance will be assessed over a 3 year period. The monitoring will be structured using the 'orders of outcomes' approach, so that the monitoring will capture a range of short, medium and long term parameters to demonstrate change.

Sources of Nitrate in Franklin Surface & Groundwaters

Auckland Council monitoring of groundwater, streams and springs in the Franklin area suggests that nitrate concentrations in many Franklin freshwater systems are elevated, and in some cases exceed the 'national bottom line' for nitrate toxicity in rivers (6.9 mg nitrate-N/L). Agricultural activities are implicated as a key contributor to this issue, however, there is no quantitative data to substantiate this. We are carrying out a pilot study to assess the validity of the dual stable isotope abundance technique to determine the sources of the high nitrate concentrations in the Franklin area. This method has the potential to fill a key knowledge gap, and if successful, could be used in other catchments where elevated nitrate concentrations are an issue.

Microbial Source Tracking – Papakura Stream Catchment

Investigation of microbiological faecal sources in the rural, upper Papakura Stream catchment. Results indicate herbivore and some human contamination, providing evidence for the continuation of a Council Waterway Protection Fund and land management advice in this catchment.

Henderson Water Quality Project

A water quality investigation in the rural part of the Henderson Creek catchment was carried out recently. The aim was to use simple water quality information and river flow to identify priority sub-catchments for land management advice, reducing sediment loss to the Waitemata harbour.

Systems Thinking

Auckland Council has recently completed a number of workshops using 'Systems thinking' to help staff to develop a shared understanding of their respective needs on freshwater management. The workshop's main focus was the development of Freshwater Management Units (FMUs), as required by the National Policy Statement: Freshwater Management. Associate Professor **Marjan van den Belt** from Massey University designed and facilitated the workshops and also introduced the concept of System Dynamics Modelling. As a result there is now increased understanding across council of how different functions within the council use spatial scales in managing freshwater and the complexities involved with the development of a spatial scale for FMUs. Overall, this process has offered shared learning opportunities and identified opportunities for further collaborative processes within council. For further information please contact **Karen Creagh** or **Christine Mitchell** at the Auckland Council.

New Team Members

Two new team members have recently joined the freshwater science capability in the Environmental Science team at Auckland Council. We welcome Dr **Edda Kalbus**, a senior hydrologist with extensive experience in the interaction between groundwater and surface water. Edda has joined us from the German University of Technology in Oman. We also welcome Dr **Laura Buckthought** who has joined us as an aquatic chemistry scientist. Laura recently completed her PhD at AgResearch, on the effects of urine patches and fertiliser on nitrogen losses in dairy farming systems and has a strong background in nutrient cycling. ■

Water Quality & Ecology

With a dry summer it has been a relatively quiet bathing season for faecal contamination, offset by increased growth of *Phormidium* at some river sites, notably the upper Whakatāne. Lake algal monitoring showed only Lake Ōkaro in bloom during early summer, with no blooms after Christmas. Other lakes, Rotoiti and Rotoehu, started blooming late summer/autumn with red alert levels being reached.

Bay of Plenty Regional Council has joined a consortium with four other North Island councils to have all their invertebrate samples processed by the one laboratory. This collaboration has led to the development of consistent spreadsheets used by each council, and it is hoped eventually to have all councils use the same taxonomic list for all their work. There is huge potential to work with other councils and research providers to end up with a 'single source of truth' taxonomic table. There is even the possibility to have new MCI tolerance scores recalculated for a complete set of invertebrate data collected by all councils from throughout the region. This will require further collaboration by councils, but would be an ideal project for funding through the Envirolink program.

A study is currently being undertaken by **Alastair Suren** and **Wally Lee** (of Tuarangi Tribal Authority) in the Rotorua region to validate the use of a Māori cultural health index and to determine any relationships between the CHI and Western assessments of stream health based on invertebrates. Following the successful completion of this work, it is planned to undertake other CHI assessments of streams throughout the Rangitaiki catchment as part of work for the Rangitaiki River Forum.

Rotorua Lakes

One of the major projects for the Lake Rotorua area is the alternative disposal for Rotorua's WWTP discharge. A Project Steering Committee consisting of key stakeholders, Council and experts has been formed to identify and select alternative options for treating Rotorua's wastewater. Several meetings have been held to consider the potential alternatives. Once the preferred options have been identified, feasibility analysis

will commence. The other big project for Rotorua nutrient removal is ammonium removal from the Tikitere geothermal field. Small scale trials have been undertaken using locally mined zeolite and have been successful in removing nitrogen from the stream waters. A larger scale trial is now being undertaken to confirm specific performance aspects for the design of a full scale plant.

Catchment Surveys

The State of the Environment (SOE) report on the estuaries of BoP is almost complete, and will provide information to feed into the Ohiwa Harbour Strategy and priority catchments—the Rangitaiki and Kaituna. Waihi and Maketu estuaries in the Kaituna catchment have had an increased presence of the red macroalga *Gracilaria chilensis* in the past two summers, raising concerns over potential eutrophication in the estuary.

Alastair Suren has been involved in a large-scale ecological survey that has been undertaken throughout the Rangitaiki River catchment with the aim of feeding into the creation of a document outlining the long-term aspirational goals and visions for the management of this catchment. This work is being undertaken for the Rangitaiki river forum, a statutory body comprising both regional and district councils, and four iwi. Over 100 invertebrate samples have been collected, and a fisheries survey has been conducted at more than 80 sites—firstly to determine the effectiveness of up-stream eel transfer programs, and secondly to determine whether any galaxiid populations exist above either the Matahina or Aniwhenua dams. Water quality samples have also been collected from a subset of 30 sites draining forestry, native bush, or pasture. ■

State of the Environment (SoE) & Community Monitoring

Since last July, water samples from our 55 river SoE sites have been tested for soluble nutrients and total nitrogen using both our existing and new analytical methods recommended by the National Environmental Monitoring and Reporting (NEMaR) workshops. The results are currently being assessed by NIWA to determine the significance of any differences in results from the two methods, and to establish whether or not a 'correction factor' can be applied to current SoE nutrient data (for temporal trends analysis purposes) if the NEMaR methods are formally adopted.

In addition to our routine SoE monitoring, GWRC is working with three different community groups to undertake parallel water quality and ecological monitoring of the Mangatarere Stream in the Wairarapa, the Mawaihakona Stream in Upper Hutt and the Waikanae River on the Kapiti Coast. The first monthly community stream health assessment was undertaken in March and parallel assessments will continue for the next 12 to 18 months. The intention of this NIWA-coordinated project is to investigate how well community monitoring and Council SoE data align, and the complementarity of iwi cultural monitoring.



Photo © Esther Dijkstra

GWRC Senior Environmental Monitoring Officer **Brett Cockeram** (second from right) with members of the Mangatarere Stream community monitoring group.



Photo © Allan Sheppard

GWRC Senior Environmental Scientist **Summer Greenfield** (left) explaining invertebrate sampling to Mawaihakona Stream community group volunteers

Investigations

Summer Greenfield continued investigations in the Hutt River catchment to further our knowledge of the drivers of benthic cyanobacteria blooms in the river, following recommendations of an expert workshop held last June. Specific work and other initiatives carried out in the past year included:

- Delivery of three public science seminars in November 2013 about benthic cyanobacteria blooms in the Hutt River, including how people can keep themselves and their animals safe. Summer, **Juliet Milne**, **Mark Heath** (Victoria University), **Susie Wood** (Cawthron), and **Karyne Rogers** (GNS Science) presented the collective scientific knowledge that has been gained on the blooms since the first dog deaths occurred in late 2005.
- Analysis of trends in the frequency of flushing flows in the Hutt River.
- Collection of spot water samples from streams, shallow groundwater and the Hutt River between the Moonshine and Silverstream bridges to better understand nutrient inputs to this part of the river which is particularly prone to cyanobacteria blooms.
- Partnering with Victoria University in a summer student scholarship that trialled the use of aerial photography taken from a small unmanned plane to monitor the spatial coverage of cyanobacteria in the Hutt River.

Mike Thompson has initiated a project to trial the deployment of time lapse high definition cameras at river and stream sites. The focus is on low flow periods and sites that are either popular (e.g., for recreation) or have some other aesthetic appeal/value but are not near an existing instrumented flow recorder. There is a particular emphasis on rivers and streams where there are significant losses and gains in flow that might not be well represented by flow data

from existing flow stations. The overall aim is to build a visual record of flow which can be used to help communicate science and inform community discussions about setting flow limits. Two trial sites are running at the moment with the aim of deploying more cameras this summer.

Mike Thompson and **Doug Mzila** have continued developing a water balance for Lake Wairarapa to help inform water allocation policy by analysing inflow/outflow, evaporation and water level measurement data. The morphology of the lake, especially the very shallow gradient of the eastern shoreline, means that even relatively small changes in lake volume related to water abstraction (or artificial water level management) have the potential to cause quite large changes to some lake characteristics (e.g., wading bird habitat).

World Fish Migration Day

GWRC's Biodiversity Department produced a poster of fish migration for some of the fish commonly found in the Wellington region and staff assisted with several community events to mark this special day. Copies of **Amber McEwan's** native fish books were donated to libraries and schools around the region, with special reading sessions offered so children could learn about the journey fish take when they migrate.

Brett Cockeram also ran a fish demonstration at Carters Reserve in the Wairarapa, with **Mike Joy** (Massey University) attending as a special guest.

'Clean-up' & Restoration Projects

Lake Wairarapa wetlands clean-up (funded by the MFE 'Fresh Start for Fresh Water' programme): we are in the second year of working together with a range of external stakeholders and landowners to improve the health and functioning of a selection of wetlands connected with or adjacent to Lake Wairarapa. There are three main arms to the



Photo © Shyam Morar

Alton Perrie (left) and Brett Cockeram setting up nets in a lower Wairarapa Valley drain to investigate its fish values.

project: lake-edge wetland restoration, development of Land Environment Plans (LEPs), and environmental monitoring.

Baseline information collected last year on the nutrient loads entering and exiting Barton's and Matthew's Lagoons has informed the design of wetlands to improve water quality at or near these sites. Diversion of water through a large wetland complex is also being proposed at a third site. NIWA scientists **James Sukias** and **Chris Tanner** are providing advice about wetland alterations, and fish, vegetation, and bird surveys have been completed at each of these areas. The LEPs being completed on farms around the lake involve riparian planting and wetland projects, as well as improvements in irrigation efficiency and effluent application. On-farm water quality sampling and fish surveys have been carried out, with the fish surveys revealing that a range of species are present in the drainage network (including brown mudfish, banded kōkopu and longfin eel), despite their degraded habitat and poor water quality. Contact **Philippa Crisp** for more details.

Mangatarere Stream catchment pilot programme: in conjunction with Aqualinc, GWRC Land Management staff facilitated a pilot study with the Mangatarere Restoration Society (MRS) using the *Wheel of Water* (WOW). The WOW is a tool which can be used to assist communities in setting limits for catchments by modelling the trade-offs in providing for different and often competing values. The MRS is now developing an action plan based on the outcomes they arrived at with the WOW (and have received funding from MPI's Sustainable Farming Fund to assist with this).

The Mangatarere catchment is also being used to trial whitua modelling (see *Regional Plan work*) and an Envirolink

Tool that is seeking to maximise the effectiveness of farm plans. NIWA and AgResearch are developing a process that uses existing tools to link resource management issues identified at catchment scale with good management practices that may be applied at farm scale. Over the last year a further eight farm plans (or LEPs) have been completed within the catchment, bringing the total prepared to 20.

Porirua Harbour catchment sediment monitoring: installation of continuous turbidity monitoring and autosampling equipment at the bottom of the three major tributaries to Porirua Harbour was completed last winter to help determine sediment loads entering the harbour from earthworks, forestry and other development/activities further up the catchment. Manual water samples (primarily for analysis of suspended sediment content) have also been collected during a number of wet weather events, including the collection of additional wet weather spot samples from tributaries within the Porirua Stream catchment. Contact **Juliet Milne** for more information.

Cultural Health Monitoring

In February, several GWRC staff joined **PJ Devonshire** (Kahungunu ki Wairarapa) on a visit to a site of significance to iwi—Maurioho Waterfall in the eastern Wairarapa hill country. Brett Cockeram demonstrated a simple method for assessing the stream water quality which can help determine whether it is suitable for cultural use. PJ was able to explain the significance of the site with the owners and GWRC staff. The site has since been added to a schedule of significant Tangata Whenua sites in the Wellington region.



Photo © Hayley Vujcich

Brett Cockeram (GWRC, left), PJ Devonshire (CEO, Kahungunu ki Wairarapa) and Mike Grace (Policy Advisor Tangata Whenua, GWRC) measure the clarity of the water.

Regional Plan Work

Many of the science team, including Summer Greenfield, Mike Thompson, **Alton Perrie** and Juliet Milne, have continued to provide technical input into the development of objectives and policies relating to water quantity, water quality, and ecosystem health for rivers and lakes for GWRC's new Regional Plan. A number of external scientists have also provided technical advice, including **Joanne Clapcott** (Cawthron) who assisted with identifying numeric outcomes for macroinvertebrate community health. This involved building a region-specific model of contemporary MCI scores and using model outputs along with reference data to identify thresholds for different river classes.

A draft Regional Plan is expected to be released in September 2014 and will eventually replace GWRC's five existing regional plans. Alongside this process, community-based committees (whaitua) are being established to make recommendations on catchment-specific water quality limits and the timeframes and methods to achieve these limits. The first of these whaitua, covering the Wairarapa Valley (Ruamahanga) was established in late 2013 and commenced work in early 2014.

GWRC Science Strategy

Coordinated by **Lian Potter**, our Environmental Science Department's science strategy has been finalised, and a strategy document, video and posters produced. An implementation plan has also been finalised which outlines the actions and projects required to realise the strategy objectives. Some of this work is already underway, including commencement of a comprehensive review of all our SoE monitoring programmes and networks and the development of an organisation-wide research strategy.

New Staff

Mike Harkness (formerly MWH) joined the Hydrology Team in the new position of Senior Analyst, and **Mark Heath**, following completion of his PhD on benthic cyanobacteria at Victoria University, has recently started as a Freshwater Scientist in the Aquatic Ecosystems and Quality Team. ■

Taranaki Regional Council

– by Fiza Hafiz, Chris Fowles, Chris Spurdle & Gary Bedford



Fresh Water Contact Recreational Programme

Exceedances of *E. coli* action levels were found on occasion at three of the seventeen rivers/streams and lakes' sites during the recreational period (Nov–April 2013–2014) due to wildfowl influences, but there were very few exceedances at the other 14 sites. Cyanobacteria levels occasionally exceeded the health standard at Lake Rotokare, Eltham. Nine river sites and two lakes sites were monitored during the season with no cyanobacteria issues. Close liaison was maintained with the Area Health Board and territorial local authorities and the TRC website was well utilised to inform the public throughout the season.

SEM Macroinvertebrates

Biological Surveys were performed at 57 sites in 25 rivers and streams. The surveys indicated that generally the proportion of 'sensitive' taxa in the macroinvertebrate communities declined down the length of the waterways—this was reflected in the deterioration in generic stream 'health' from 'very good' in the upper reaches, through 'good' in mid-reaches, to 'fair' to 'good' in the lower reaches. The macroinvertebrate communities at all ring-plain sites have

also been assessed in terms of predictive relationships recently established for ring-plain streams, taking into account altitude and/or distance from the National Park. Evaluations of generic and predictive stream 'health' have also been performed and assessments made for all sites in relation to River Environment Classifications (REC) predictions. A number of sites (10 in mid reaches and 10 in lower reaches) recorded new historical maximum MCI scores, while no decreases in minimum scores were recorded in the 2012–2013 period. These are clear trends of improving MCIs across the region. Improvements were particularly apparent within the Punehu, Kaupokonui, Kapoiaiaia, and Waiokura Streams and in the Waingongoro River.

SEM Periphyton

The Council monitors periphyton twice a year, in spring and summer, at 21 sites in 10 catchments around the region. The MfE guidelines specify that long algae filaments should not exceed 30% of the river bed, and thick algae mats should not exceed 60%. The results for the 2013–2014 monitoring year showed that all sites met the MfE guidelines for thick mats. Two sites (Waiongana Stream at SH3 and Kapoiaiaia Stream near the coast) exceeded the MfE guideline for long filaments once during the monitoring period.

Macroinvertebrate Recolonisation Project

TRC have provided data (macroinvertebrate, water quality, periphyton data, and aerial photography) to assist NIWA in a project involving research into stream connectivity and invertebrate recolonisation in Taranaki with regard to riparian planting initiatives in the region.

Stream Habitat Assessment Protocol

The final year for the Stream Habitat Assessment program continued this year. Twenty-one new sites have been visited and data will be compiled, together with the previous 44 sites conducted during the last two years. A review of the Rapid Habitat Assessment protocols was conducted by Cawthron Institute, and TRC was involved in the workshop looking into having a national SHAP protocol and consistent reporting across New Zealand.

SEM Riparian Management Water Quality Monitoring Programme

The Riparian programme consists of continual monitoring of four catchments in the Taranaki region. A state and trend report is in its first draft form for the Kaupokonui catchment and looks at a range of parameters and their trends—such as periphyton, macroinvertebrates, recreational bathing, temperature, and SHAP, in relation to riparian planting initiatives and agricultural discharge. TRC is aiming to focus on a final draft for peer review and roll out a similar template for three other major catchments in the region; this work currently collates data for the past 12 years.

Special Project

TRC are running a continuing investigation into the source of faecal contamination in rivers and streams with high bacteriological count. In 2014, the Huatoki Stream in New Plymouth was tested using PCR markers. The results indicated some human, wildfowl and cattle contamination and sampling at a series of locations is helping to pinpoint possible sources. The Taranaki Regional Council and New Plymouth District Council are continuing their investigations and further sampling will be carried out.

Regional Freshwater Plan

The Council has commenced a review of the Regional Freshwater Plan for Taranaki (the current Plan was made operative in 2001). A number of papers addressing freshwater management issues have been submitted to Council. These papers represent significant progress in the review of the Freshwater and Soil Plans and are being used to inform the development of a draft Plan and or initiate discussions with a focus group of key stakeholders plus others.

Papers prepared to date set out future directions on:

- The management of farm dairy effluent.
- The management of river and stream bed modification.
- The management of gravel extraction in Taranaki rivers and streams.

- Diffuse sources of water contamination, including riparian management.
- The protection of freshwater biodiversity, including wetlands.
- The management of oil and gas operations in Taranaki.

The Council has made significant progress on draft provisions for a revised Plan and is currently working through the implications of the National Objectives Framework and Freshwater Management Units for Taranaki to give effect to the *National Policy Statement for Freshwater Management 2014*. The Council expects to have a draft Plan out for targeted consultation at the end of 2014.

TRC Freshwater Staff

Conor Lee, new scientific officer—Surface and Groundwater Resources, **Regan Phipps**, Biological/Hydrology manager, **Victoria McKay**, Physical/Chemical Manager, and **Denise Young**, new Policy Analyst, have been involved in the review of the freshwater plan.

The rest of the team is the same as last year but just to refresh your memories!:

Fiza Hafiz, Scientific Officer for State of the Environment Monitoring programmes. **Chris Fowles**, Scientific Officer Water Resources, leads various SEM projects and performs biological macroinvertebrate and other consent monitoring. **Bart Jansma**, Scientific Officer Freshwater Biology, juggles fish pass investigations and investigations into effects of riparian restoration and hydroelectric power scheme consent monitoring. **Brooke Thomas**, scientific officer Freshwater Biology, is involved with the SEM periphyton programme and cyanobacteria monitoring on rivers. Ray Harris, Technical Officer, gathers the samples for several SEM programmes along with **Abbie Bates**, who works between departments. **Rachel McDonnell**, Technical Officer, collects SEM groundwater samples, and **Fiona Jansma**, Scientific Officer Hydrology, leads the hydro team. Warrick Johnston, Hydrology Officer, **Thomas Brackenrig**, Hydrology Officer, and **Chris Spurdle**, Planning Manager, have also been involved in the review of the freshwater plan. ■



TRC Council officer conducting benthic cyanobacteria monitoring at Waiwhakaiho River

Mapping Freshwater Wetlands in Tasman District

Trevor James is two years into a project to map all freshwater wetlands on private land in Tasman District (John Preece had made a start on this in the late 1990's-early 2000's but he became unavailable to finish off). While well behind targets for completion of the wetland database, the advantage is that the high resolution imagery available now means that reasonably accurate draft maps can be supplied to owners of wetlands. The disadvantage is that we have continued to lose a large number of wetlands (despite rules against infilling, flooding or destroying wetland being in place since 2001). Good communications with landowners is the absolute key to the success of this project.

Monitoring & Management of Freshwater & Estuarine Environments in Tasman District

Trevor continues to run Tasman's River Water Quality, Bathing Water Quality, Toxic Algae, Freshwater Fish and Stream Habitat, and Estuary Monitoring Programmes. While we are reasonably happy with the network design of the River Water Quality Monitoring Programme (RWQMP) to deliver the key questions about risks to water quality (it may not deliver on national needs for more reference sites), Trevor believes there is a desperate need to review many of the details of protocols used in this RWQMP. But until these are agreed upon nationally, the programme continues as is. Once this review is done then we really want to be part of a national auditing system (commissioning external auditing is considered too expensive as an individual Council).

One-off investigations include: sampling the Motueka/Riwaka River plumes in an effort to predict faecal indicator bacteria concentrations along the Kaiteriteri coast and working with Birds NZ to revise the status and trends of Tasman's Shorebird populations. Restoration projects Trevor runs include the fish passage barrier assessment and remediation programme and stream sediment removal and riparian planting projects. Assisting the new collaborative governance projects in the Waimea and Takaka and coastal catchment areas is also a reasonable effort. ■



Trevor diving in the Motupipi River (near Takaka) in the middle of winter to recover a car battery.

The Waikato Regional Council has completed another summer season of invertebrate and freshwater fish SOE monitoring. The second consecutive drought this summer produced stable flows across the Waikato region, enabling the survey teams to complete the surveys within timeframes. The fisheries team (run by **Callum Bourke**) surveyed a record total of 65 sites this season (December to May) using both electric fishing (51 sites) and netting (14) protocols as appropriate. Following the conclusion of the field season the team undertook an extensive multi-agency lakes survey on New Zealand Steel land at Taharoa, south of Kawhia. Four lakes in the area (Lakes Numiti, Rotoroa, Pio pio and Rototapu) were identified as being data deficient, so teams from DOC, NIWA and the WRC banded together to fill these knowledge gaps. The survey was very successful and we are currently in the process of creating a joint technical report on the findings. The invertebrate team (run by **Mark Hamer**) collected 154 macroinvertebrate samples across the region. Mark has also completed another round of freshwater mussel monitoring including a mark recapture trial.

Bruno David has been leading an otolith microchemistry project—this multiagency project hopes to identify and prioritise the importance of sites in the lower Waikato River basin for juvenile native and exotic fish. High frequency lake monitoring buoys have been deployed in lakes Whangape and Waahi in conjunction with the University of Waikato to aid our shallow lake monitoring programme. Bruno presented at the Fish passage Symposium and has been heavily involved in the Carp-N Neutral project removing pest fish from Lake Waikare. Two students helped in this work this summer—**Iain McKinnon** researching the migration cues of pest fish and identifying common spawning grounds using otolith microchemistry, and **Holly Molesworth** investigating the timing and triggers of biota using the Lake Waikare fish pass, with an emphasis on shortfin and longfin eel population dynamics.

Kevin Collier continued his non-wadeable river work and produced a revised aquatic plant monitoring guideline. Kevin has now moved to Waikato University and been replaced by **Michael Pingram**, who joins from the Department of Conservation. Michael will continue to work as a freshwater ecologist working on river and stream indicators. **Mike Lake** has been continuing his work looking at the effects of land drainage and river works carried out by River & Catchment Services and how best to mitigate for them. Highlights over the past year were the recovery of giant kōkopu from a stream as it was being de-silted, and trialling the installation of artificial fish habitats in the Ohote Stream. **Tracie Dean-Speirs** continues to work as a Lake Management Officer in the River & Catchment Services Division. This year she has

been focussed on preparing a Shallow Lake Management Plan, and has also been involved in a number of lake management and restoration projects that have involved lake level setting, inflow monitoring and farm planning around sensitive peat lakes, and planning for surveys of data deficient lakes. Tracie has also continued to co-ordinate meetings of the agencies involved in the Waipa District Peat Lakes Accord, and the Waikato District Lakes & Freshwater Wetland Memorandum of Agreement.

Asaeli Tulagi continues to coordinate the region's surface water quality monitoring programmes, which include the routine monitoring of more than 130 sites. Regular monitoring includes 110 river and stream sites on the regional rivers monitoring programme, 12 sites on the Waikato River monitoring programme, 14 lakes in the shallow lakes monitoring programme, and 10 coastal water quality sites in the harbour monitoring programme. Hydro-lakes algal monitoring and bathing beach surveys are additions to the summer programme. A highlight of the past year has to be the facilitation of the very first co-management field day with Te Arawa River Iwi (TARIT) in the upper catchment stations of the Waikato River. Other highlights include: annual water quality publications, involvement in the multi-agency approach to solve the red lake mystery at Lake Waikare, and an 18 month collaboration work with NIWA to specifically provide monthly training and support to a group of community researches involved in a nationwide study on citizen science at Mapara stream, Lake Taupō. ■



Freshwater mussels *Echyridella aucklandica* (bottom) and *E. menziesii* (top) marked and ready to return to the stream.



Installing artificial habitats in the Ohote Stream.



Some of the 178 giant kōkōpu recovered from 1.3 km of stream during mechanical de-silting.

RESEARCH & CONSULTANCY COMPANIES

ATS Environmental



ATS Environmental is based in Eastern Bay of Plenty and continues to work with councils and government agencies throughout New Zealand. **Marli Dee** has joined the team, bringing her enthusiasm and experience from being an MPI fisheries observer.

In June, **Kelly Hughes** once again attended the International Fish Passage conference in Wisconsin USA where he presented the New Zealand perspective including introducing rubber culvert baffles developed by ATS.

The team at ATS are passionate about reconnecting New Zealand's waterways, especially with respect to restoring native fish passage. Over the last year, ATS has continued to design and develop a range of solutions for mitigating obstructions to fish passage—the 'solutions toolbox' now includes fish friendly gates, culvert baffles, mussel-rope securing systems and fish ramps.

Kelly has been appointed to the Fish Passage Advisory Group and is looking forward to working with engineers and ecologists to further advocate the importance of restoring New Zealand's aquatic biodiversity.

Looking to the future, ATS is looking to expand the programme of training workshops for council staff and post-graduates. ■



Marli Dee



Kelly Hughes

Over the past 12 months, Aquanet Consulting has been involved in a wide range of projects, including project management, field studies, technical reports, peer review and involvement in a number of hearings as expert witnesses. We have also welcomed a new addition to the Aquanet team, with **David Wiessing** helping with a number of field studies and the processing of macroinvertebrate samples.

Olivier Ausseil was involved in the Board of Inquiry hearing for the Tukituki proposal, which concluded in January. The Board granted the resource consents authorising the Ruataniwha water storage scheme, and Olivier is continuing in his advisory role for the next phases of the project. Olivier is also assisting Greater Wellington Regional Council with the assessment of resource consent applications for the Featherston, Greytown and Martinborough wastewater treatment plants, and with compliance assessments for the Masterton and Carterton wastewater treatment plants. Olivier has also undertaken water quality monitoring and assessment of effects at and around a number of exploratory oil well drilling sites. Olivier has also peer-reviewed a number of technical reports, including for the Canterbury Regional Council and the Cawthron Institute, and is continuing with his role as the Palmerston North Wastewater Monitoring Group facilitator.

We have completed the development of a *daily time-step model* enabling the detailed assessment of the effects of wastewater discharges on water quality. This model is proving

particularly useful when contemplating split land/water discharge regimes. We applied our model to the Feilding and Shannon municipal wastewater discharges and the AFFCO Feilding treated meatworks effluent discharge, with the outputs of our modelling forming part of the assessment of effects for the resource consent applications for these discharges.

We are assisting the Palmerston North City Council with a project aiming at reducing algal/cyanobacteria blooms in the city's water reservoirs (Turitea dams), and reducing effect on stream health downstream of the dams, with Max Gibbs from NIWA providing key advice and expertise to the project.

Fiona Death and **Amy Feck** are completing a 12 month monitoring programme of water quality within the dams. It is likely that line aerators will be installed in the dams, and the monitoring we are undertaking will help define the number and position of the aerators, as well as their management.

Fiona, Amy and David have also undertaken periphyton and macroinvertebrate surveys of the Whangawehi Stream (Mahia Peninsula), the Rangitikei River at Bulls, and the Porewa Stream at Hunterville, in relation to wastewater discharges at these sites. We are also about half way through a 24 month survey of water quality, habitat, fish and macroinvertebrate surveys of the Waiwiri Stream, near Levin. This project aims to assess the effects of land application of treated wastewater from the Levin township on the Waiwiri Stream. ■



Monitoring the Waiwiri Stream, near Levin.

Another year has passed and our team has been keeping busy on a number of interesting projects, including stream diversions, daylighting, rehabilitation and restoration, ecosystem health monitoring, low impact design, and fish passage assessments. The team has been expanding lately and we are excited to say we now have 23 Ecologists, including **Ian Boothroyd**, who joined our Auckland office in June 2014. Ian, **Tanya Blakely**, and **Vaughan Keesing** continue to be active in freshwater research on chironomids, geothermal systems, urban streams, sediment generation, restoration, and copepods. **Eddie Sides** and **Mark Lewis** have been busy incorporating ecology into the master planning and design of waterways around the Auckland Region.

Read on for project highlights over the last 12 months...

Rehabilitating, Daylighting & Recreating Waterways

Boffa Miskell has been involved in a number of rehabilitation and restoration projects around the country. Many of these have been in urban areas, and often as part of residential developments, Special Housing Areas in Auckland, or

roading projects like MacKays to Peka Peka (M2PP) and Transmission Gully in Wellington. Mark Lewis continues to showcase the benefits of using Low Impact Design for freshwater ecosystems in urban developments, particularly in the Auckland Region. The Auckland and Wellington offices have been busy with a number of daylighting and waterway construction projects, primarily in response to urban developments and roading projects (e.g., M2PP, and Transmission Gully). The La Rosa Stream Daylighting Project is a great example of bringing a previously buried stream 'back to life'. Mark worked with the Auckland Council Stormwater Unit to 'daylight' a 200 m section of the Avondale Stream, restoring two reaches to open, naturalised channels and improving in-stream and riparian habitat conditions. Auckland Council's Research, Investigation and Monitoring Unit (RIMU) is continuing with the monitoring of these restored reaches, and so far it appears that they are providing habitat for inanga, eels and the stonefly *Zelandobius* and mayfly *Neozephebia* (these insect taxa were not previously recorded in the piped waterway).



La Rosa reserve southern stream after culvert removal, daylighting and subsequent riparian planting and boardwalk construction

Eddie Sides has been involved in a number of large-scale projects integrating landscape and design through the master planning and detailed design phases, to bring ecological benefits to waterways in Auckland's housing projects. This work has included assessing existing ecological values and ecological constraints, working with designers and landscape architects, and design stream rehabilitation projects to improve riparian habitats and fish passage connectivity. **Craig Pauling** continues his work on Te Waihora/Lake Ellesmere, and is on the Ahuriri Restoration Steering Panel to assist with bringing together ideas for the potential restoration of this significant wetland in the lower Huritini/Halswell River. **Barbara Risi** has been following sediment generation, long term deposition trends, and stream diversions and recreations in Duck Creek, Whitby (Wellington), including a number of fish salvage events. Tanya Blakely has been working with the Canterbury Earthquake Recovery Authority and the Christchurch City Council, collecting baseline aquatic ecological information for the Avon River Precinct as part of the Christchurch Rebuild. As part of this work, Christchurch Ecologists surveyed macroinvertebrate, fish communities and in-stream and riparian habitat at sites destined for rehabilitation works and at upstream reference sites. These data will be invaluable in assessing physical and biological changes in the river post-rehabilitation. Vaughan Keesing has been working with Contact Energy to survey and then develop a restoration programme for the Torepatutahi wetlands and waterways in the central North Island. This site has a range of in-stream and wetland values, highly prized as a trout reservoir and contains one of the larger populations of the native 'at risk' narrow leaved stinging nettle.

Fish Passage Assessments

Tanya, Barbara, and **Sharon De Luca** have been working with the Tauranga City Council (TCC) to assess if TCC's stormwater assets (pipes, culverts, and weirs) are potential barriers to fish passage. As part of this work, they'll be helping TCC to prioritise the remediation of any of these assets that have been identified as potential fish passage barriers. The Auckland ecologists have also been involved in the design of a 6 m high fish pass in the Silverdale area.

Ecosystem & Cultural Health Assessments & Aquatic Monitoring

A number of ecosystem health surveys and monitoring programmes have kept our Ecology team busy nationwide. Barbara, Vaughan, and **Matiu Park** have been busy surveying and monitoring waterways in the Wellington Region for the roading projects M2PP and Transmission Gully, analysing long term NTU data/TSS and flow data, and collecting seasonal baseline data on a range of in-stream components. Tanya, Barbara, and **Scott Hooson** completed a large survey of the Avon River catchment for the Christchurch City Council (CCC). This information has helped to inform the CCC of the current health of the catchment, and identify tributaries or areas with the catchment that may be of greater ecological health, or that would benefit from rehabilitation efforts. Craig Pauling is looking at working with Te Rūnanga o Ngāi Tahu to

continue the development and use of their 'Takiwā' cultural monitoring tool, particularly within freshwater and coastal environments, and to update the tool for use on an iPad or smart tablet platform.

Louise Clark, in the Tauranga office, has been assessing the Ruakura drainage networks east of Hamilton. This has included surveying the native fish populations and assessing the effects of urban development on water quality and habitat values. Louise has been working alongside Harrison Grierson hydrologists to design the extensive stormwater wetland networks that will replace the existing farm drains. Following on from presenting evidence on freshwater values at a Board of Inquiry for the Ruakura Plan Change, Louise has commenced preliminary work on a Native Fish Management Plan to ensure mudfish and eels can be successfully re-established in the newly created habitats. This is an exciting long-term project with ambitious goals for significant enhancement of biodiversity and water quality in a rural environment. As well as general surveying and monitoring, we've been working on a number of projects assessing potential ecological effects on freshwater ecosystems, including recommending ways to avoid and mitigate effects, and to identify potential opportunities for rehabilitation and restoration for positive ecological outcomes.

'Riverscape & Flow Guidelines' Now Available Online

The 'Riverscape and Flow Guidelines' document is now available for free download from our website—see www.boffamiskell.co.nz/downloads/publications/C08008_Final_Guidelines_Report_secure_20090709.pdf. These guidelines (developed as part of FRST-funded research conducted by Landscape Planner Yvonne Pfluger, Boffa Miskell colleagues and NIWA) were prepared to assist those involved in the assessment of river landscapes as an input to water allocation decisions. They provide information useful for managers, decision makers, and landscape specialists involved in water allocation investigations and can be used in conjunction with ecological assessments.

Biosecurity

Marcus Girvan has had another successful year managing Land Information New Zealand's (LINZ) biosecurity operations on LINZ-administered land. This has largely involved managing aquatic weeds in Lakes Benmore, Wanaka, Dunstan and the Rotorua lakes, along with terrestrial plant and animal pests in a number of river systems. Boffa Miskell has also expanded its Biosecurity team, with the recent employment of **Helen Blackie** in the Auckland office. ■

Karen Shearer has been involved in a variety of interesting projects with her freshwater teammates over the past year, including research work on the relationship between drifting invertebrates and flow, the development of a molecular MCI with **Susie Wood** and post-doc **Eddy Dowle**, developing an adult trout prey index, and assisting in stream flow habitat survey fieldwork on the Tokiahuru Stream (near Ohakune) – a habitat restoration project being funded by Genesis and involving local iwi belonging to Ngāti Rangī. She’s also taken on the exciting role as the NZFSS Newsletter ‘bug-person’ and is still playing hockey despite being old enough to be everyone in her team’s mum, and enjoying coaching. Chocolate is still a high priority in Karen’s life.

Annika Wagenhoff organised a ‘Threshold Workshop’, funded by the MBIE programme ‘Management of Cumulative Effects of Stressors on Aquatic Ecosystems’ which was attended by an enthusiastic bunch of 34 researchers and stakeholders/end-users from around the country that came together in Nelson to share their latest research on ecosystem thresholds in rivers, lakes and estuaries, and to discuss how this knowledge can be applied in policy and management. Annika also has been presenting her threshold work at the Joint Aquatic Sciences Meeting in Portland, OR, and at five European universities (in Umea, Toulouse, Bilbao, Barcelona and Konstanz) where she mingled with the freshwater people.

Finally, Annika has been collaborating with the Otago Stream Team on another multi-stressor mesocosm experiment.

Among a mountain of work last year, two highlights for **John Hayes** were: 1) determining the relationship between invertebrate drift concentration and flow in the Maitai River, and 2) complementing Māori cultural flow assessment with hydraulic-habitat modelling for assessing environmental flows. The latter investigation was to assist Genesis Energy and Ngāti Rangī in reaching an agreed flow regime decision for the Tokiahuru River, which drains Mt Ruapehu near Ohakune, and feeds the Tongariro Power Development Scheme. The drift study on the Maitai River was also motivated by an interest to inform environmental flows. We found that drift concentration decreases with flow reduction meaning less food for drift feeding fish. The outcome of the drift research, coupled with fish bioenergetics drift-foraging modelling, will be a change in the way instream flow requirements of drift feeding fish are assessed, and more conservative minimum flow and water allocation limits.

Aside from routine biomonitoring and periphyton assessment work, **Craig Allen** has been working on several projects that assess the health of the Maitai River in Nelson. This has involved the comparison of land cover to historical river health indicators, as well as a study that looked at the downstream influence on water quality of the Maitai Reservoir.

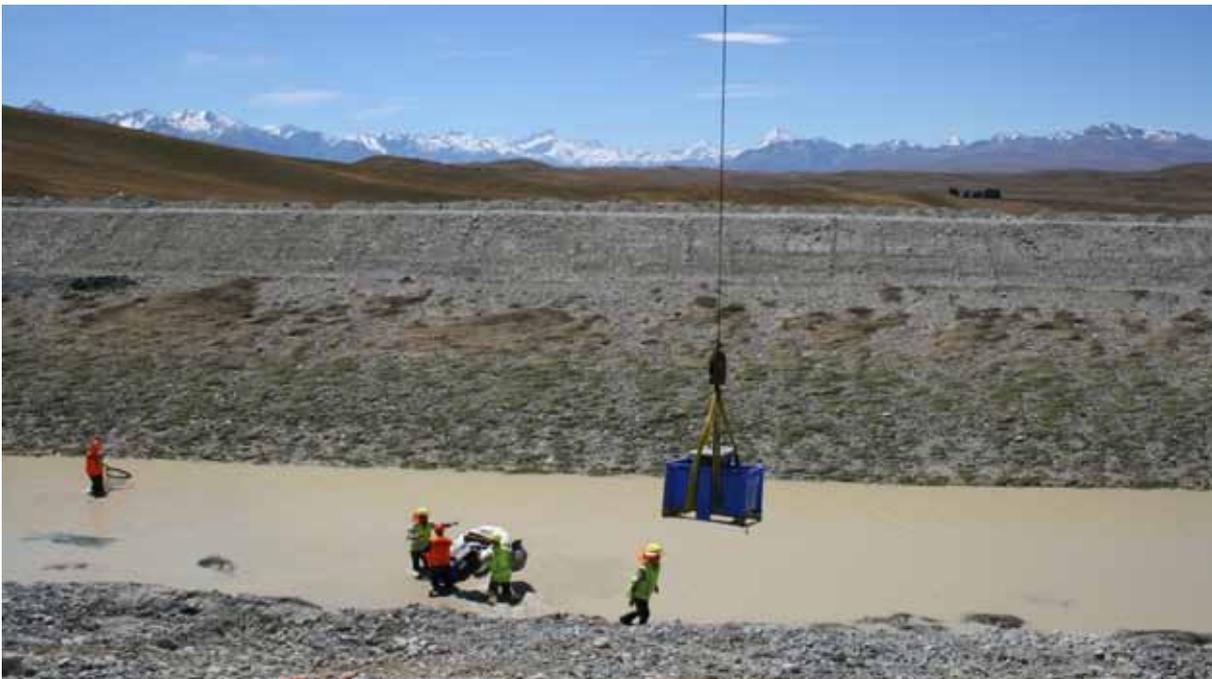


Cawthron, NIWA and Ngāti Rangī staff discuss selection of cross sections for hydraulic-habitat modelling on the Tokiahuru Stream, Ohakune.

The last year flew by for **Kati Doehring** with one of the highlights being the launch of the Land Air Water Aotearoa (LAWA) website (www.lawa.org.nz) in March 2014. Contributing and validating the scientific content of the website as well as assisting with the graphic design kept her busy for most of last year. On the scientific side of things, Kati is currently writing up the results from her study in the Waikato, trying to answer the questions of how large and how old riparian vegetation has to be before any improvements in functional indicators are visible. Kati's passion for fish passage has lately had a boost, too – she's been invited to be part of New Zealand's first multi-agency 'National Fish

Passage Advisory Group' AND gets to fix some pretty major fish passage issues in her local Nelson waterway – the Maitai River. She's expecting her second child in October.

As the latest addition to the Cawthron Freshwater Team, **Marc Jary** has enjoyed developing into his role that began in August 2013. Since then, Marc has been very busy travelling from one end of the country to the other on various field work trips, including the Tekapo fish salvage (see photos below), sampling in the Wairarapa as part of the Cumulative Effects programme and drift sampling macroinvertebrates in the Mataura River.



(TOP) The 'Native Fish Team' salvaged over 7,500 bullies during the 2014 Tekapo Canal Salvage Operation. (BOTTOM) Salvaged fish were lifted out of the Canal by a crane and then transferred to a Canal section further downstream.

Roger Young has had another busy year with involvement in the Tukituki Catchment Proposal, launch of LAWA and on-going work on threshold responses to environmental stressors and rehabilitation of aquatic ecosystems. A recent highlight has been hikoī to Murihiku and the Waitaki Catchment as part of the new Ngā Kete o te Wānanga project.

On the research side **Joanne Clapcott** has been really interested in temporal variability, especially at reference sites, and how this information can be used to inform restoration targets or the resilience of rivers. Tools for incorporating multiple indicators/values (e.g., habitat, sediment, stream functions) into environmental management and reporting still rock her boat. And on the application side of things, she has been trying to help central and local governments make sense of the strengths and limitations of river metrics. She is really looking forward to the future challenges of the NPS-FM and swimming in the odd river or two...

David Kelly has been focusing mainly on water quality management in lakes and reservoirs. This included some sediment-water nutrient recycling work with Otago University (**Marc Schallenberg**) in Te Waihora and in the Maitai River reservoir. He has also been working with DOC and Environment Canterbury on estimating nutrient loads to Canterbury high-country lakes and its relationship to in-lake response and ecological integrity. This was based on some earlier modelling work he did with **Denis Özkundakci** (Waikato University) looking at a national set of deep stratifying lakes (Özkundakci *et al.*, 2014). Some earlier work looking at ecosystem services provided by lakes, with his section covering fisheries and tourism, has come out in a book chapter published by Landcare

Research (Schallenberg *et al.*, 2014). Dave continues to be involved in a science advisory role with MfE on NOF attributes to protect lake ecosystem health.

Rasmus Gabrielsson has been investigating the response of trout fisheries to the cumulative effects of intensive agriculture (as a part of the NIWA led MBIE funded project “Management of Cumulative of Stressors on Aquatic Ecosystems”) in collaboration with researchers from NIWA, University of Otago and staff from regional councils and Fish and Game Councils around New Zealand. Rasmus has also been appointed to the TAG for the “Save NZ Rivers Trust” which will be launched in November 2014. ■



Debin Meng from Wageningen University (Netherlands) completed a 4 month Masters internship with Susie Wood on profiling *Microcystis* scums to better understand the stressors created in this micro-environment.



The Ngā Kete team discussing cultural values in the Waitaki Catchment



Susie Wood and Jonathan Puddick continue to work with David Hamilton (UoW) on their Marsden Funded work investigating toxin production in bloom-forming cyanobacteria; *Microcystis*. This year's activities involved two sets of fieldwork at Lake Rotorua (Kaikōura) where they conducted mesocosm experiments, performed fine-scale lake profiles and attempted to assess the structure of a cyanobacterial scum....and survived a tropical cyclone....



Hugo Borges began his PhD through the University of Waikato with David Hamilton (UoW), Susie Wood and Jonathan Puddick. Hugo will be investigating the effect of specific environmental parameters on toxin production in bloom-forming *Microcystis* using an in-lake mesocosm approach as well as modelling toxic *Microcystis* scum formation and the inherent effect on microcystin levels.



During the 2013 Cawthron Science Festival, which was held in Nelson and attended by over 800 people, Cawthron hosted a display on toxic and nuisance algae with 'hands on' activities including microscopes and cultures.

The EOS team has seen a few changes over the last 12 months. We happily welcomed back **Vicki Flavall** returning from maternity leave to take up her Team Assistant role. The science communications team expanded with the addition of Digital Support Specialist **Sarah Mankelow**, whose wordsmith skills compliment Senior Designer **Bronwyn Gay's** world-class visual design abilities. Managing Director **Erron Henderson** has been very busy making sure the business runs smoothly, with one of his greatest achievements this year being the upgrade of the coffee machine and refining his barista skills.

The science team is now four-strong with **Shelley McMurtrie, Alex James, Tom Drinan, and Kirsty Brennan**. They have all had a busy year, with all four involved in supervising the in-river works for one of major projects of the year—the Te Papa Ōtākaro/Avon River Precinct (ARP) Anchor Project—as well as their other commercial and research projects. More recently Alex has been kept busy with his upcoming move within the company to its first North Island premises—the science centre that is Palmerston North! **Amber Sinton** and **Nick Hempston** were joined in the lab by **Matt Wallace** for five months, and were also supported by a wide network of casual technicians as they worked like Trojans accurately identifying tens of thousands of tiny invertebrates. They are looking forward to a new addition to the technical team, with a permanent position advertised mid 2014.

We also had the honour of working more closely with Emeritus Professor **Mike Winterbourn** of the University of Canterbury this year, which the team thoroughly enjoyed, especially Amber and Shelley.

While not a staff member per se, a special mention must be made for **Paul Bisby**, whose monthly massages are such a highlight—staff have been known to plan their annual leave around the days he is in the office so they don't miss out!

A Milestone Year for EOS Ecology

It's been a year of achievements for the team at EOS Ecology; with some key milestones reached that are the culminations of years of work.

- **Stage one of the in-river portion of the Te Papa Ōtākaro/Avon River Precinct (ARP) Anchor Project** was completed between Montreal St and Colombo St bridges, with our science team on-site for the duration of the construction phase, supervising the in-river works. Over 3000 tonnes of sediment were removed, 5400 m² of gravels cleaned, 10 fresh plains created, and 5000 plants planted along the fresh plains. Go to www.eosecology.co.nz/Our-Projects/Restoration-Design-and-Monitoring.asp to watch some of the videos associated with the programme.
- **With Stage one of the ARP completed, EOS Ecology is beginning the post-enhancement phase of their monitoring programme.** With a BACI (Before-After-Control-Impact) design, the aim of the detailed monitoring programme—covering habitat, invertebrates, fish, trout spawning and egg survival—is to find out which interventions are working and which aren't (and if not, why not). We are proud to be contributing to the global research community on the science of urban waterway enhancements.
- **We published the first ever identification keys to the freshwater invertebrates of Campbell Island,** which went online in early July (ciinvertkey.com). Working with Emeritus Professor Mike Winterbourn of University of Canterbury and taxonomists from around the world, we have been able to describe 36 taxa in the keys and associated information sheets. Read more about this achievement on page 10.
- **EOS Ecology has secured a five-year contract to provide State of the Environment monitoring for six of the North Island's nine regional councils.** It's a testament to our continued focus on quality and ongoing investment in our lab, and offers huge advantages to the Councils in comparing data from different regions to build a robust SOE national 'big picture'.
- **At the start of 2014 we completed a seven-year shellfish food-safety monitoring programme,** looking at *E.coli* and norovirus levels in cockles of the Avon-Heathcote Estuary/Ihutai. Originally designed to look at the effects of discharging treated sewage into the ocean instead of the estuary, the timing of the programme also allowed us to monitor the effects of the unprecedented discharge of untreated sewage into the city's rivers following the Christchurch earthquakes.
- **EOS Ecology expands its offices north** – We are excited to announce that we are expanding our operations by opening an office in Palmerston North on 1 September this year. The move is a natural progression for EOS Ecology, which already offers its full range of aquatic science and visual communication services to several North Island clients. Now we are in a better position to offer a more personal touch!
- **Our dedication to the environment saw us supporting the revival of the Cashmere Stream Care Group.** This enthusiastic community organisation had waned post-earthquake, but was motivated to start up again on the back of a recent EOS publication on the current state, pressures, and possible future for Cashmere Stream (www.cleanwaterways.org.nz/pdf/cashmere-stream.pdf). With



Stage One of the ARP in-river works. All photos © EOS Ecology



Downstream of Montreal St (LEFT) before and (RIGHT) after the enhancement. All photos © EOS Ecology

the help of EOS Ecology science and communications, they have set up a community water quality monitoring programme and started venturing into the field of self-promotion, with a new logo and brand.

- **Reports, brochures and large display banners;** all have had Bronwyn's Midas touch gilding the DOC brand to create an appealing portfolio for DOC's Arawai Kakāriki Wetland Restoration Programme. This is an important project that deserves to have the best visual communication resources at its disposal to help promote the great work they do and we're really proud to be contributing towards this.
- **EOS has joined the Enviro-Mark family,** and we are working towards the ultimate goal of earning a Gold Enviro-Mark rating. Clients are starting to want, even demand, that their suppliers are demonstrating they care for the environment. Enviro-Mark certification programme provides that independent evidence that we are walking the talk!

Aqua-man Works for EOS

You could be forgiven for thinking the staff of EOS are all mild-mannered scientists... but there's been a touch of superhero in the air this year! We've performed several fish-rescue missions, worthy of reality TV.

- **Mission 'Octogenarian'** – Media scrambled to film the rescue of fish octogenarians from the Ōtākaro/Avon River, just below the Bridge of Remembrance. Our team of hard-hat heroes fished out resident longfin eels/tuna and other fish from a key section of the river before the construction works commenced. Among the haul were several longfin eels/tuna, who by their size Shelley estimates were at least 80 years old. Almost 300 fish were relocated along the river prior to works commencing in key sections.
- **Mission 'black hole'** – We got the call that a bridge on Banks Peninsula had one of its footings undercut, creating a nice home for very large eels/tuna. Before they could repair and fill the hole, EOS was called in to extract the eels and relocate them further upstream. We pulled out at least 15, saving them from a watery grave. Some of them were quite large – their combined age would have been several hundred years.
- **Mission 'flatfish'** – Two of our team made a mercy-dash to the Ashley/Rakahuri River, before a temporary ford made of concrete slabs was placed into the river to allow heavy machinery to cross. Bullies, eels, and galaxiids were removed and relocated safely downstream.
- **Mission 'mudpile'** – But the craziest fish rescue this year saw us electric fishing in mud. As part of the Ōtākaro/Avon River in-river construction, over 3000 m² of sediment was removed and stockpiled prior to going to landfill. Where the sediment was wet enough we were able to pass an electric current through the mud—and pulled out over 400 eels/tuna and several "nationally vulnerable" lamprey/piharau, which were happily returned to the river.

Looking Forward to 2015

The next twelve months looks like it will be an exciting time for EOS. There are a number of large projects that will be great for the team to sink their teeth into—including the design and construction of riffle habitats in the Halswell River, a catchment-wide study of sediment inputs to the Halswell River, overseeing the construction of the last two stages of the ARP in-river works, undertaking fish and invertebrate surveys on the Banks Peninsula and identification of the aquatic invertebrates—along with a range of other projects that will serve to keep the team out of trouble. ■



ARP monitoring.

All photos © EOS Ecology



SOE invertebrate processing.



Our Cashmere Stream Care Group contributions include monitoring training & design work.



(LEFT) Mission 'black hole', (RIGHT) Mission 'mudpile'.

Since its establishment in 2009, Freshwater Solutions has grown, with Dr **Mike Fitzpatrick** and **Nick Carter** joining **Richard Montgomerie**. Freshwater Solutions continues to be involved in a range of resource consent related work, including resource consent compliance monitoring for Fonterra in the Waikato, Watercare in Auckland, Norske Skog in the Bay of Plenty, Francis Mining Ltd on the West Coast, and Alliance Group Ltd in Southland. Freshwater Solutions has also recently prepared AEEs for Alliance Group Ltd and Ryman Healthcare, as well as for various land development projects in Auckland. Earlier in the year Freshwater Solutions completed a study of the Tekapo River for Genesis Energy and a fish survey of the Mangere River, in Northland, for DairyNZ. We continue to enjoy working with a wide range of environmental professionals from many different organisations including Cawthron, NIWA, URS, Fraser Thomas Ltd, Mitchell Partnerships, Charles Mitchell, Jowett Consulting, Raineffects, Aqualinc, PdP and Aquatic Environmental Scientists. ■



Photo © Winsome Blair

Richard undertaking kicknet sampling in the Tekapo River.



Photo © Newmont Waihi Gold Ltd

Nick Carter getting excited about his job.

Golder Associates is involved in a wide range of projects, including project management, field work, and technical reporting.

Dr. **JoAnna Lessard** has been busy over the last year providing technical input for the development of several Sub-Regional Plans under Environment Canterbury’s Land and Water Regional Planning framework. She is currently developing a field specification for the improved monitoring of streams within Canterbury to improve our understanding of catchment-level conditions and the efficacy of stream mitigations.

Richard Allibone is undertaking a range of projects associated with irrigation projects, including Canterbury mudfish assessment for properties in the Central Plains Irrigation scheme near Christchurch, and providing assistance to a South Canterbury farm operation that is creating new mudfish habitat. He is also leading environmental feasibility studies for irrigation options for the Manuherikia Valley in Central Otago and assessing options for rare non-migratory galaxiids in the area. Some of his other work is on stream management and restoration for a coal mine site in Southland—including the creation of new stream habitat and translocations of Gollum galaxias to the new stream as part of the stream relocation programme. Richard also continues his role as an expert panel member reviewing consent monitoring actions for the Patea Dam in Taranaki.

Annabel Barnden has been keeping out of trouble working on a variety of projects that took her around the country surveying in-stream habitat, periphyton, macroinvertebrates and fish communities. Much of her current work involves undertaking ecological assessments for irrigation and mining companies, but she is looking forward to being involved in projects closer to home, specifically, the proposed Canterbury streamwalk assessments (those for which JoAnna is currently developing the field specification for).

Katherine Gareau is the latest addition to the team. She has a Master Degree in Freshwater Ecology and worked on a range of environmental assessment projects. She has experience in fish monitoring, vegetation inventory, wetland delineation, lake food-web sampling (water, fish, invertebrates, sediments), and the impact of human development (e.g., mining, road and railway construction). She has also worked on a New Zealand national project which involved meeting with threatened species experts to better understand how to manage these species and prioritise the work. Katherine has broad experience in dealing with a range of stakeholders, and has international experience working on projects in Canada and the Congo. In the next few months she will be involved with water quality and ecological assessments projects. ■



Dr. Lessard getting cozy with eels in South Canterbury.



Dr. Lessard gauging a lowland stream in the Selwyn/Te Waihora.



Fieldwork on the West Coast.



Richard Allibone taking notes.



Things are all go at Kessels Ecology—2014 has seen our team expand and some new and exciting projects begin. **Hamish Dean**, a botanist, GIS specialist and restoration ecologist, joined the Kessels Ecology team in late 2013 and has been working to identify significant natural areas and develop riparian, lake and wetland restoration plans. Recently he has put together a restoration plan for Lake Rotomanuka and coordinated surveys of Auckland Council reserves in the Franklin District. **Wiea van der Zwan** has also joined us as an ecologist specialising in botany and GIS work.

Gerry Kessels is currently working to create restoration strategies for riparian margins of Lake Waikare in collaboration with Matahuru Papakainga Marae, and for the Red Rivers area near Taupiri, in collaboration with NZTA and the Tangata Whenua Working Group. He has also recently been involved in several roading projects around the Waikato.

Jen Price (Blair) has been working with the Department of Conservation to develop an environmental baseline and monitoring programme for the Hikurangi Catchment, Northland, as part of the Living Water partnership between DOC and Fonterra. She has also recently carried out a review of the DOC's Lake Serpentine pest fish netting programme which will appear as a case study in the University of Waikato's invasive fish management workshop and handbook.

Brenda Bartels will be coming on board in September to cover Jen's maternity leave. Brenda studied Hamilton's urban fish populations for her MSc, and since then has worked for Kessels as a freshwater ecologist and at NIWA as a freshwater technician. She is a passionate freshwater fish ecologist with excellent skills in freshwater assessment, monitoring and evaluation of ecological effects.

Our research project at Limestone Downs examining the effects of dairy farm conversion on freshwater ecology and cultural values has been progressing well, with sampling planned for at least an additional 2 years. This project has been jointly funded by the C. Alma Baker Trust and Ngāti Tahinga, who have provided additional support for creation of a restoration plan for the farm.

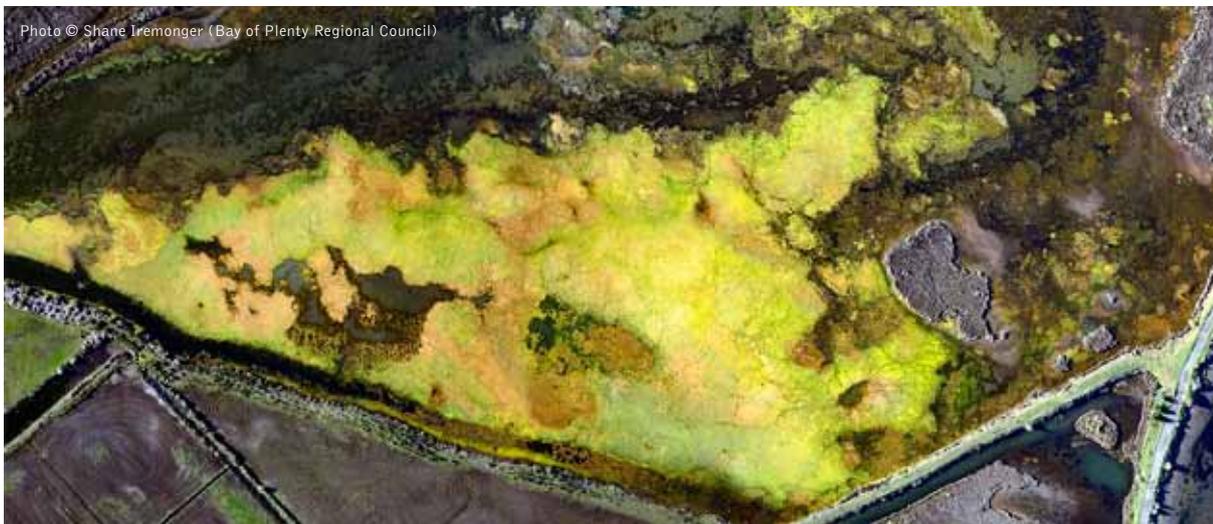
In 2009, **David Riddell** of Kessels Ecology identified an abundant population of black mudfish in a farm drain that would be affected by construction of the Waikato Expressway near Rangiriri. In winter 2013, the Kessels team removed several mudfish from the drain to tanks at the University of Waikato. Special thanks to Nick Ling for taking care of them all this time. Now their reconstructed and enlarged habitat at Rangiriri has been completed and the fish will be re-released in early September. Monitoring is planned for 3 years following release to gauge the success of relocation. ■

River Lake Ltd

Keith Hamill has been involved in a number of interesting projects over the year, including investigating water quality trends in lakes in the Auckland region with Auckland Council, analysing the underlying drivers of water quality trends in Te Waihora/Lake Ellesmere, and characterising the ecological condition of Maketū estuary with Bay of Plenty Regional Council (BOPRC).

BOPRC is seeking consent to re-divert more of the Kaituna River back into the Maketū estuary. The investigations

we have done to assess potential effects has highlighted the extent to which the estuary has degraded as a result of nutrient inputs and reduced flushing. This is graphically illustrated in the photo, below, which shows floating rafts of the cyanobacteria *Lyngbya* sp. on a 14 ha impounded section of the lagoon. In this part of the estuary the anoxic sediment and daily minimum dissolved oxygen, regularly less than 2mg/L, excludes all benthic fauna. ■



Lyngbya bloom in an impounded section of Maketū Estuary. This section of the estuary has minimum DO regularly less than 2 mg/L, anoxic sediments and no benthic fauna.

Riverscapes Freshwater Ecology



Over the past year, Riverscapes has been involved with a number of projects including running exotic fish removal trials in Bartoon's Lagoon (Wairarapa), fish passage assessments in the Parangarahu Lakes and some Otaki wetlands, and collaborating with DOC and Massey University to produce a brochure educating people on how to tell the difference between longfin and shortfin eels (with the goal of hopefully conserving a few more longfins). **Amber McEwan** has

created a website for Riverscapes (www.riverscapes.co.nz), which includes a page where free educational material can be downloaded. As sidelines, Amber has written another children's book about freshwater fish (which is due out August 2014) and has published the final two papers from her Masters (see the 'recent publications' section). She has also been working with DOC preparing a number of guideline documents and reviewing the Freshwater Fish Recovery Plans. ■

Ben Ludgate has spent some time in the Clutha River in 2014. Working with **Greg Ryder** and **Jarred Arthur**, Ben completed surveys of macroinvertebrates inhabiting the permanently wetted areas of the river. Back in the lab, **Katie Blakemore** did well to sort through the large amounts of didymo in each sample. With **Ruth Goldsmith**, Ben also surveyed adult eel populations in the Clutha hydro-electric lakes. Spotlighting and fyke netting were successful in detecting a few of the elusive creatures. Further afield, with Ruth and **Brian Stewart**, and working with Fish and Game, Ben successfully completed the logistically challenging helicopter transfer of 400 adult trout into Marlborough's Branch River catchment. Back in Dunedin, Ben and the team have assisted with the Water of Leith flood protection works, surveying macroinvertebrates to assess effects of the works, and relocating fish isolated during bankside redevelopments. Ben also continues to manage the Dunedin lab, with processing of invertebrate and algae samples from throughout the country.

Katie has had a busy first year at Ryder Consulting, spending a lot of time in the lab processing many of the invertebrate and algae samples received in the lab. Exposure to the wide diversity of samples received from throughout the country has helped to increase her knowledge considerably. Katie has also assisted with several field projects, including sampling of stormwater discharges into freshwater and marine environments, invertebrate and fish surveys of Dunedin's urban streams, and periphyton and invertebrate surveys at an Otago gold mine.

Jarred has escaped New Zealand for a six month exodus to the exotic and diverse continent of South America. He has

navigated his way from the southern depths of Patagonian Argentina north to the tropics of Ecuador and Columbia. The Ryder team are all very jealous of Jarred's adventures, particularly his escapades at the FIFA World Cup and his trip to the Galapagos Islands. Along the way he visited the Pantanal, the world's largest tropical wetland area, where he fished and feasted on piranha whilst spotting tapir, anteaters, jaguar, macaw, and caiman. He also experienced the Andean Highlands of Peru before entering the Amazon basin. Jarred looks forward to returning to New Zealand and seeing us all again in October.

Greg has had an interesting year, with projects ranging from the assessment of water quality in rural streams throughout the South Island, through to being a member of an EPA decision making committee. He has been assisting various clients implementing regional water plan requirements and returned to his old stomping ground in the Clutha River to undertake some benthic survey work. Greg has been spending much of his free time engaging in mountain biking and enjoying his house at Lake Hawea.

Meanwhile in Christchurch, Ruth has enjoyed regular trips to the West Coast over the summer, monitoring periphyton (and the progress of the West Coast Wilderness Cycle Trail). Other fieldwork for Ruth has included investigating fish passage options at hydroelectric power schemes, and fish screening and bypass design at water takes. As usual, there has also been plenty of time at the computer, and most recently Ruth has been assisting Greg with the development of water quality monitoring plans for clients in Canterbury and the West Coast. ■



(TOP) A lovely day at the 'office', Lake Hawea. (BOTTOM) Ben Ludgate releasing a longfin eel in the Clutha River.

Stark Environmental Ltd



John and Yvonne Stark established Stark Environmental Limited in June 2007 and have been offering specialist freshwater ecological research and consulting services (primarily concerned with macroinvertebrates, biotic indices, and biomonitoring), and undertaking macroinvertebrate sample processing for over seven years. SEL employs three part-time staff to assist Yvonne with sample processing when the work load demands.

In the past year to date we have processed 700 macroinvertebrate samples for 18 different clients from throughout New Zealand and prepared 20 client reports. Projects have included the freshwater aspects for re-

consenting Fonterra's dairy factory at Whareroa, Horizons Regional Council SoE monitoring and reporting, consent biomonitoring for a small hydroelectric scheme, two open-cast coal mines, petrochemical industries at Kapuni, a meatworks, and a salmon farm. John prepared a report for Taranaki Regional Council that defined MCI limits and objectives for rivers in Taranaki, and developed a regional MCI for Northland Regional Council. In coming months John will be working with Michelle Greenwood, Doug Booker, Martin Unwin (all from NIWA), and Joanne Clapcott (Cawthron) on an Envirolink-funded project revising the MCI. ■

Streamlined Environmental



Jim Cooke, Ngaire Phillips and **Tim Cox** have joined forces to provide environmental science consulting services, specializing in water quality, ecology, modelling and RMA-related services. Our projects to date have included providing expert advice on issues as diverse as sediment impacts on a significant wetland, to potential ecotoxicological issues associated with deep sea mining. Much of our work involves providing advice to clients (regional and national government departments, iwi organisations) on implications of the RMA to their practices or to the activities of others. Jim has been working with **Helen Rouse** (NIWA) and **Channa Rajanayaka** (Aqualinc) to develop guidelines for freshwater accounting systems for regional councils, one of a suite of tools being

developed under the National Objectives Framework. Ngaire has been extending her knowledge of water quality through a number of RMA-related projects, as well as providing expertise in ecotoxicology of metals for a Ngāi Tahu-led submission on proposed phosphorite mining on the Chatham Rise. Tim is developing a water allocation model for a US client and is starting a project modelling the effects of flushing a shallow hypertrophic lake. Jim and Ngaire are also enjoying the many challenges of establishing and building a business. ■

T&T's Ecology team has been busy over the last year with a wide range of projects including mines, state highways, water supply, irrigation, private development, hydropower schemes, and ongoing environmental monitoring for consent compliance. **Brett Ogilvie** continues to lead the team, which has ten staff with aquatic and terrestrial expertise.

Liza Inglis has recently left the team to head to London for her OE, but promises to come back soon (we hope!). **Shaun Ogilvie** has joined the team and is based in the Christchurch office, while **Megan Young** has joined the Auckland team, working on a variety of infrastructure projects, as well as helping out on Christchurch EQC work.

We have continued to be involved in the implementation of the Waterview Connection motorway project in Auckland with Brett as the ecology team leader. **Caleb Sjardin**, **Sara McMillan** (née Howarth), **Duncan Law** and **Kieran Miller** have been assisting with the implementation of management plans and undertaking environmental monitoring/species relocations with works now underway. Kieran, **Graham Ussher** and **Matt Baber** have been looking after terrestrial aspects such as rare plants, birds and lizards. **Nathan Watson** has also been helping on this and other projects on a part-time basis.

The team has also been involved in projects monitoring the success of fish passes and working on solving fish passage problems. Caleb, Duncan and Brett have been involved with monitoring of the native species successfully using the Taharoa fish pass, as well as undertaking a wider catchment survey of the lake and streams above the fish pass. Caleb and Duncan have also been working on designing a torrentfish friendly ramp to allow 'trap and haul' to be used as a fish passage option for sites in Auckland.

The team has continued its ongoing monitoring of residual flows for a number of water supply dams and hydro lakes. Over the past four years **Dean Miller**, Caleb, Duncan and Kieran have been carrying out consent monitoring for the Tongariro Power Scheme. This has involved monthly excursions to the central volcanic plateau to carry out periphyton and macroinvertebrate monitoring at a range of sites. For the past two years the team has also been involved in monitoring changes in stream quality, before and after the upgrade of the Waiouru wastewater treatment plant.

In Hamilton, Dean is continuing to work with the Mangakōtukutuku Stream Care Group (MSCG), Hamilton City Council and Waikato Regional Council staff on a stream restoration project funded by the Waikato River Cleanup Trust. Dean has also been involved in the consenting of the SH1 Huntly bypass project, to mitigate effects on a number of streams, lakes and wetlands. Other work in Hamilton has included a major stormwater monitoring project for Hamilton City Council covering the impacts of stormwater on stream habitat and sediment contamination levels, and looking at fish passage issues associated with stormwater infrastructure.

The team has also been involved in all levels of the consenting process for various projects. We have continued to undertake Stream Ecological Valuation assessments in the Auckland Region and beyond. Brett continues to assist **Ian Hogg** and **David Hamilton** by presenting post-graduate seminars at Waikato University.

On the International front, Brett and Matt have been involved in an assessment of coastal protection and re-vegetation options for Kiribati (financed by the World Bank). Caleb has also been involved in an ecological and water/sediment quality assessment for a port improvement project in Samoa (financed by the Japanese Government). ■

IWI ORGANISATIONS

Ngati Rangi Trust



Hannah Rainforth has been working with Genesis Energy, Cawthron Institute and Tipa Associates to determine flows for a local waterway impacted by existing hydro. This project has combined cultural assessments with the IFIM and utilised collaborative decision making to attempt to cater to ecological, cultural and generation needs. Hannah worked on the Ruapehu diesel spill clean-up and the subsequent resource

consent process for a much-upgraded and safer storage system, continues to be involved in court processes for the Raetihi Hydro Scheme, and is working on other RMA matters such as local sewage upgrades. On a more positive note, Hannah has helped bring CyberTracker (www.cybertracker.org) to NZ shores, creating an app for iwi members to monitor eels and other fish in the region using their smartphones. ■

NON-PROFIT ORGANISATIONS

Working Waters Trust



A New Trust is Born

Announcing the existence of a new charitable trust, dedicated to freshwater education and rehabilitation...Working Waters Trust! Started up by a group of young freshwater ecologists and planners, Working Waters Trust is dedicated to the betterment of native fish and the human communities which surround them in Aotearoa. 'Spreading galaxiid love' in particular is our game!

Lan Pham keeps busy running the project aspect of the trust across Canterbury, Southland and Otago. Our projects generally start with community education aimed at developing a sense of pride and ownership around 'their' local endangered galaxiid, followed by advising on and supporting the practical steps communities and landowners can carry out to improve fish habitat and make sure their special local species are around for future generations.

Matt Wylie has been finding time amongst his PhD lab work and conference trips to join forces with Otago Museum working towards putting his captive raised giant kōkōpu where they belong...in the limelight of public display to enable regular adoration and worship. Matt is also particularly passionate about the prospects of developing rūnanga based projects within their respective rohe—ultimately integrating traditional science and mātauranga Māori.

We are really proud of our grass-roots galaxiid restoration projects to date. However, we were increasingly feeling pretty frustrated at feeling like “what is the point of working in these wee bubbles, when all around us, when it comes to freshwater in the big picture, the sky is essentially falling?!” We wanted to use our meagre time and resources to start an initiative called ‘Nobodies Rivers’ to be a collective voice for people who want to work toward creating a freshwater legacy we can all be proud of. With **Nicki Atkinson**'s Science Communication background, a short video (vimeo.com/97644420), appropriate grammar argument and a facebook page (www.facebook.com/nobodiesrivers) later—we're up and running. As part of it we've put together 'an appeal' to ask freshwater students and professionals from around NZ to support a message of concern and call for a change in the relationship we currently have with our freshwaters. The response so far has been incredibly positive and encouraging but also alarming. We are hearing loud and clear the frustrations of freshwater professionals who are dispirited by the state of NZ's freshwaters and the direction they are heading. We'd love to do some more work in this space to unite these people and voice their concerns to the wider public. Get in touch or stay tuned! ■



Photo © Nicki Atkinson

Working Waters Trustees: (left to right) Lan Pham, Matt Wylie, Nicki Atkinson and Emerson Yeoman. Dedicated to celebrating and enhancing our native freshwater biodiversity and addressing the deeply concerning state of New Zealand's freshwater environment.



A proud landowner pointing out an escaping Nationally Endangered Pomahaka galaxiid (a NEW species!! For all you fish geeks out there) in the Washpool stream, Pomahaka catchment.



Galaxiid fever has been reported to be sweeping Southland. Photographic evidence of it overwhelming a mob of Clutha Valley School kids.



The captivating pull-power of Canterbury mudfish and the expertise of Leanne O'Brien (Ichthy-o-niche mudfish extraordinaire! Leanne's been helping us with our mudfish projects) at St Andrews, South Canterbury

USEFUL LINKS

- **CAREX: The Canterbury Waterway Rehabilitation Experiment**
www.biol.canterbury.ac.nz/ferg/carex.shtml
- **CyberTracker**
www.cybertracker.org
- **DOC: Arawai Kākāriki Wetland Restoration Programme**
www.doc.govt.nz/conservation/land-and-freshwater/wetlands/arawai-kakariki-wetland-restoration
- **DOC: Fish Passage**
www.doc.govt.nz/fishpassage
- **EIANZ**
www.eianz.org
- **EOS Ecology: Campbell Island Bicentennial Expedition**
www.campbellisland.org.nz
- **EOS Ecology: Campbell Island Invertebrate Key**
www.ciinvertkey.com
- **EOS Ecology: Cashmere Stream**
www.cleanwaterways.org.nz/pdf/cashmere-stream.pdf
- **Fish Passage Conference**
fishpassage.umass.edu
- **NZFSS**
www.freshwater.science.org.nz
www.facebook.com/NZFSS?ref=bookmarks
- **NZFSS: Water Symposium 2014**
www.2014watersymposium.co.nz
- **Land Use and Water Quality Conference**
web.natur.cuni.cz/luwq2015
- **LAWA**
www.lawa.org.nz
- **LERNZ**
www.lernz.co.nz/index.html
- **Riverscapes**
www.riverscapes.co.nz
- **Riverscape and Flow guidelines (Boffa Miskell)**
www.boffamiskell.co.nz/downloads/publications/C08008_Final_Guidelines_Report_secure_20090709.pdf
- **Waikato University data repository for lakes**
lernzdb.its.waikato.ac.nz
- **Whitebait Connection**
www.whitebaitconnection.co.nz
- **Working Waters Trust - Nobodiesrivers**
www.vimeo.com/97644420
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Recent Publication reference formatting style guide sourced from www.royalsociety.org.nz/publications/journals/nzjz/instructions-for-authors/#references.

CONFERENCES

New Zealand Freshwater Sciences Conference 2014: 24–28 November

The 2014 NZFSS Conference will be held in Blenheim as a joint conference with the New Zealand Hydrological Society and the IPENZ Rivers Group.

More information is available at www.2014watersymposium.co.nz and on Facebook (www.facebook.com/NZFSS).

New Zealand Freshwater Sciences Conference 2015

The 2015 NZFSS Conference will be held in Wellington as a joint conference with the Australian Limnological Society.

More information will be available on our website (freshwater.science.org.nz) and on Facebook (www.facebook.com/NZFSS) closer to the time.

Land Use & Water Quality (LuWQ) 2015

LuWQ2015 is an international and interdisciplinary conference on the cutting edge of science, management and policy to minimise effects of agriculture and land use changes on the quality of groundwater and surface waters. The 2nd International Interdisciplinary Conference on Land use and Water Quality: Agricultural Production and the Environment will be held, in Vienna, Austria, 21–24 September 2015.

Abstract submission will be possible by the end of September 2014; abstracts are due by 1 February 2015.

See web.natur.cuni.cz/luwq2015 for more information.

Fish Passage 2015

The international conference on river connectivity best practices and innovations will be held in Groningen, Netherlands, from 22–24 June 2015.

See fishpassage.umass.edu for more information. ■

AWARDS

Check out our website for details on the following awards:

S.I.L TRUST FUND TRAVEL AWARD

freshwater.science.org.nz/index.php/awards/sil-trust-fund-1987-travel-award

S.I.L TRUST FUND GUEST LECTURER AWARD

freshwater.science.org.nz/index.php/awards/sil-1987-trust-fund-guest-lecturer-award

BEST STUDENT PAPER AWARD RECIPIENTS

freshwater.science.org.nz/index.php/awards/best-student-paper-award

V.H. JOLLY STUDENT TRAVEL AWARDS

freshwater.science.org.nz/index.php/students

CONFERENCE AWARDS

freshwater.science.org.nz/index.php/students ■



NZ FRESHWATER
SCIENCES SOCIETY MEDAL
& HONORARY MEMBERSHIP



New Zealand Freshwater Sciences Society Medal Recipient

2013 (in absentia)

Carolyn Burns

The New Zealand Freshwater Sciences Society Medal is awarded for outstanding contributions to understanding and management of freshwaters by a member of the NZFSS. Professor Carolyn Burns will be presented with the award at this year's conference in Blenheim. Carolyn has been a long-standing member and stalwart of the society, and is hugely respected by NZFSS members for her scientific knowledge, rigour and sustained contributions over many years. She has served terms as President and Secretary-Treasurer for the Society.

Carolyn has been a long-standing member of the International Society for Limnology (SIL) and has served as its President (1995–2001). She was also the New Zealand representative to SIL for many years. In terms of ecosystem protection and conservation, Carolyn has been the Regional Councillor for Australasia and Oceania for IUCN (World Conservation Union) and has advised and chaired several committees on behalf of the Department of Conservation.

Carolyn has research interests focused on biological processes and population dynamics in lakes, plankton ecology and productivity, water quality and the conservation of aquatic ecosystems. The scientific paper that launched her standing as a scientist of international renown was 'The relationship between body size of filter-feeding Cladocera and the maximum size of particle ingested', published in *Limnology and Oceanography* in 1968, and currently with 480 citations. This work followed on from her Ph.D. thesis at the University of Toronto on 'The feeding behaviour of *Daphnia* under natural conditions'. Carolyn has maintained a productive publication output for many years and has a tremendous wealth of knowledge that she has contributed to further understanding of zooplankton ecology in lakes. More recently she has contributed publications related to the occurrence of invasive zooplankton in New Zealand lakes.

Carolyn has played a major role in science and technology at many levels within New Zealand. She has been President of the Royal Society's Academy, a member of the Board of the National Institute of Water and Atmospheric Research (NIWA), and a member of the Governance Boards of the Allan Wilson Centre for Molecular Ecology and Evolution, and the New Zealand Antarctic Institute. She is also a Fellow of the Royal Society of New Zealand and has been Academy President of the Royal Society of New Zealand.

Carolyn Burns has only recently stepped back from her full-time role as Professor of Zoology at the University of Otago. She has had significant administrative roles within the University of Otago including, for example, Head of this Department from 1998 to 2005. She currently chairs the University of Otago Governance Board for Genetics and is on the Advisory Board for Environmental Sustainability. She has also chaired University of Otago review panels, including (in 2011–12), for example, the Departments of Music and Theatre Studies, Philosophy, Anatomy, and Anthropology and Archaeology. At a wider university level her experience has been used in roles as a member of the Cycle 4 panels (university quality assessment) for Victoria University and Lincoln University and she has chaired the Cycle 4 panel for the audit of the University of Waikato. Her expertise as an academic reviewer has been used in institutions in New Zealand, Australia, Sweden and the Netherlands. As anyone reading this synopsis of Carolyn's scientific career will appreciate, she has made an extraordinary contribution to science in New Zealand and it is appropriate that her achievements are acknowledged by the Society through award of its highest honour of achievement. ■

For rules and criteria see freshwater.science.org.nz/index.php/awards/nzfss-medal

RULES FOR AWARDS

1. The New Zealand Freshwater Sciences Society Medal is for an outstanding contribution to our understanding and management of freshwaters by a member of the Society, with criteria for consideration of nominations as set out below.
2. Nominations for Medals are considered by the Awards Committee (currently comprising the President, Secretary-Treasurer, a SIL Trustee and two members elected at an AGM).
3. Honorary membership of the Society can be voted at a General Meeting of the Society, for those members who have performed significant service to the Society usually over a long period, on the recommendation of the Executive Committee as set out in the Society rules.

Criteria for the Medal:

Matters for consideration by the Awards Committee (not all need apply in any particular case and not in priority order):

- National or international recognition of research or management output
- Leadership in particular fresh or brackish water science field
- Quantum and quality of research or management output
- Contribution to education or public knowledge of freshwater science
- Contribution towards sustainable management of freshwater environments
- Contribution towards the conservation of one or more species, habitats or freshwater ecosystems

There would be an expectation that any members nominated and considered worthy of this elevated status would be recognised in an appropriate fashion, such as in an award ceremony at the annual conference, to which the person awarded would be invited at the Society's cost and expected to provide a presentation. Nominations would include relevant biographic information, a statement of the nominated person's specific outstanding contributions to freshwater science in New Zealand and letters of support from at least two additional members of the Society at least one of whom is not employed by the same organisation. The closing date for nominations is 15 September 2012. There would be no expectation that any Award need be presented in any given year. It is recommended that nominations are made without prior knowledge of the nominee.

Criteria for Honorary Membership of the Society:

As is set out in the Constitution, persons considered eligible for honorary membership are recommended to a General Meeting of the Society by the Executive Committee. Criteria for the award would usually involve significant service to freshwater science and/or to the Society, usually over a lengthy period. It is recommended that any nominations for honorary membership could be received by the Executive committee from members at least two months prior to any General Meeting of the Society, to provide time for the Committee to consider these and make a recommendation to the General Meeting with adequate notice as required in the Society Rules. ■

BUDGET FOR THE YEAR ENDED 30 JUNE 2013

NZ Limnological Society (Inc)
t/a NZ Freshwater Sciences Society
Statement of Financial Performance
for the Year ended 30 June 2013

	2013	2012
	\$	\$
Income		
Book Sales	437	2,652
Cost of Sales		
Opening Stock	9,735	919
Book Publishing Costs	-	11,249
Closing Stock	9,480	9,735
	255	2,433
Gross Profit	182	219
Interest Received	1,937	2,395
Subscriptions	9,703	5,209
Conference Income	6,852	835
Donations	89	165
Prize Income	-	750
	18,763	9,573
Expenses		
Award -NZFSS Best Student Paper	500	
Award - VH Jolly Memorial Student Travel		11,500
Award - SIL Trust Prize	800	1,000
Bank Charges	718	545
Conference Seeding Fund	5,000	5,000
Conference Costs	113	3,097
Medal Engraving	21	
Membership Fees	1,200	1,200
Postage	-	146
Printing - Newsletter	-	537
	8,352	23,025
Net Surplus/(Deficit) for year	10,411	(13,452)

**Statement of Movements in Equity
for the Year ended 30 June 2013**

	2013 \$	2012 \$
EQUITY		
Opening Balance	67,600	81,102
Movement for the Year		
Current Years Surplus/(Deficit)	10,411	(13,502)
Total Equity	<u>78,011</u>	<u>67,600</u>

**Statement of Financial Position
as at 30 June 2013**

	2013 \$	2012 \$
ASSETS		
Current Assets		
Bank of New Zealand	12,604	5,459
GST Refund	-	1,694
Accounts Receivable	7,692	3,050
Interest Accrued	84	643
Stock on Hand	9,480	9,735
	<u>29,860</u>	<u>20,581</u>
Investments		
BNZ Term deposit	50,304	52,827
Total Assets	<u>80,164</u>	<u>73,408</u>
LIABILITIES		
Current Liabilities		
Accounts Payable	279	5,625
Subscriptions in Advance	244	183
GST	1,630	-
Total Liabilities	<u>2,153</u>	<u>5,808</u>
EXCESS ASSETS OVER LIABILITIES	<u>78,011</u>	<u>67,600</u>
EQUITY		
Members Funds	78,011	67,600
	<u>78,011</u>	<u>67,600</u>

Approved by Executive

Signed



Date

11.2.2014

Signed



Date

11/2/14

Notes to the Financial Statements for the Year ended 30 June 2013

1. STATEMENT OF ACCOUNTING POLICIES

The financial statements presented here are for the entity the NZ Limnological Society (Inc) an Incorporated Society under the Incorporated Societies Act 1908.

These financial statements have been prepared in accordance with generally accepted accounting practice. The accounting principles recognised as appropriate for the measurement and reporting of earnings and financial position on an historical cost basis have been used, with the exception of certain items for which specific accounting policies have been identified.

(b) Changes in Accounting Policies

There have been no changes in accounting policies.

All policies have been applied on bases consistent with those used in previous years.

(c) Differential Reporting

The NZ Limnological Society (Inc) qualifies for Differential Reporting because:

- it is not publicly accountable, and
- it is deemed to be 'not large' due to the following criteria –
 - * the gross turnover is less than \$20 million, and
 - * the total assets are less than \$10 million, and
 - * there are less than 50 fulltime employees.

The NZ Limnological Society (Inc) has taken advantage of all available differential reporting exemptions.

(d) Income Tax

The NZ Limnological Society (Inc), is exempt from income tax as it is a scientific research body as defined by section CW 49 of the Income Tax Act 2007

(e) Goods & Services Tax

The statement of financial performance has been prepared so that all components are stated exclusive of GST. All items in the statement of financial position are stated net of GST with the exception of accounts receivable and accounts payable which include GST.

(f) Investments

Investments are carried at the lower of cost and net realisable value.

(g) Inventories

The Society sells copies of *The Guide to Freshwater Crustacea of NZ*. Inventory is valued at cost price on a first in first out basis.

(h) Receivables

Receivables are stated at their estimated realisable value. Bad debts are written off in the year in which they are identified.

(i) Subscription Income

The subscription income is due from the members July of each year to cover the period from July to June of the following year. Subscription income is recognised as it is received. Unpaid subscriptions are not recognised as a debtor at year end. Subscriptions that are paid in advance during the year are recognised in the Statement of Financial Position.

2. AUDIT

These financial statements have been subject to audit. Please refer to the Audit Report.

3. CONTINGENT LIABILITIES

At balance date there are no known contingent liabilities (2012: nil). The NZ Limnological Society (Inc) has not granted any securities in respect of liabilities payable by any other party whatsoever.

4. CAPITAL COMMITMENTS

At balance date there were no known capital commitments. (2012: nil).

5. EVENTS SUBSEQUENT TO BALANCE DATE

No events or transactions have occurred since balance date which would have a material effect upon the financial statements or which are of such significance as to require mention in these notes to the financial statements. There are no plans or intentions that may materially affect the current value or classification of assets and liabilities.

INDEPENDENT AUDITOR'S REPORT

To the Members of NZ Limnological Society (Inc)

Report on the Financial Statements

I have audited the financial statements of NZ Limnological Society (Inc) on pages 1 to 5, which comprise the Statement of Financial Position as at 30 June 2013, and the Statement of Financial Performance and Statement of Movements in Equity for the year then ended, and a summary of significant accounting policies and other explanatory information.

Committee's Responsibility for the Financial Statements

The Committee are responsible for the preparation and fair presentation of these financial statements in accordance with generally accepted accounting practice in New Zealand and for such internal control as the Committee determine is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditor's Responsibilities

My responsibility is to express an opinion on these financial statements based on my audit. I conducted my audit in accordance with International Standards on Auditing (New Zealand). Those standards require that I comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgement, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates, as well as evaluating the overall presentation of the financial statements.

I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my audit opinion.

Other than in my capacity as auditor I have no relationship with, or interests in, the NZ Limnological Society (Inc).

Basis for Qualified Opinion

In common with other organisations of a similar nature, control over income prior to its being recorded is limited, and there are no practical audit procedures to determine the effect of this limited control. Consequently I am unable to determine whether any adjustments to income are necessary.



Qualified Opinion on Financial Position and Financial Performance

In my opinion, except for the possible effects of the matter described in the Basis for Qualified Opinion paragraph, the financial statements on pages 1 to 5 present fairly, in all material respects, the financial position of NZ Limnological Society (Inc) as at 30 June 2013 and its financial performance for the year then ended in accordance with generally accepted accounting practice in New Zealand.

Other Matters

This is the first year that I have performed an audit on the financial statements of the NZ Limnological Society (Inc). My opinion only relates to the receipts and payments and closing balances for the year ending 30 June 2013. I have not audited the prior year comparatives. I have ensured that the comparatives agree to the audited financial statements for the year ending 30 June 2012 as supplied by the Committee.

Angela Wood
Chartered Accountant
Blenheim

11 February 2014



Photo © Angus McIntosh

MINUTES OF THE 46TH ANNUAL GENERAL MEETING OF THE NEW ZEALAND LIMNOLOGICAL SOCIETY INC.

(Trading as the New Zealand Freshwater Sciences Society)

[For Approval: Minutes to be approved and confirmed as true record at the 2014 AGM]

The AGM was held at The University of Waikato on Wednesday 21st August, 2013. The meeting opened at 4:05 pm.

Present: David Hamilton, President; Janine Wech, Secretary-Treasurer; and 41 members.

1. Apologies

Carolyn Burns, Vivienne Cassie Cooper, Jon Harding, Susie Wood.

2. Minutes of the 45th AGM circulated

3. Matters arising from minutes of the 45th AGM

Two corrections to the minutes were required:

- i. Bob Wilcock's name spelt incorrectly (now corrected);
- ii. Under item '6. SIL 1987 Trust Fund' the following was omitted: "freeze funding of awards from SIL Trust (only exception is SIL student awards), allowing funds to build up for 3 to 4 years" (now inserted).

Matters arising from minutes: Dealt with under general business.

Motion: That the minutes be accepted as a true and correct record of the 45th AGM (Neil Deans/Janine Wech – carried)

4. President's Report

During our 2012 conference in Dunedin, our society put out a collective statement to raise awareness of the imperilled state of freshwaters in New Zealand and the pressures on freshwater from land use change and intensification as well as water abstraction. The Society also highlighted the extraordinary level of management and policy response necessary to address this issue. Our collective statement appeared to have an impact through media, organisations and community groups. It may have in part prompted the continuation of the Ministry for the Environment (MfE) co-ordinating a large amount of work since that time, with over 50 scientists from NZFSS being involved in various capacities over the past year, including committees and panels relating to National Environmental Monitoring and Reporting (NEMAR), National Environmental Standards (NES) and the

National Objective Framework (NOF). Members of NZFSS also had involvement to varying degrees in the independent Land and Water Forum. Some of that momentum appears to have stalled and it is essential that it is picked up again in light of the fact that there is work to progress for some time into the foreseeable future, in order that we attain the comprehensive limits-based policies and regulations recommended by the Land and Water Forum.

I would like to thank many members who provided their feedback on the Dairy Accord which was adopted last month. As pointed out by members, some aspects of the Accord relating to freshwater protection are at snail's pace, for example a provision that 100% of all dairy farms with waterways will only have to have a riparian management plan by 31 May 2020. The other issue identified by members was that riparian actions would apply only to permanently flowing streams greater than 30 cm depth. This only serves to demonstrate that the Freshwater Reforms based on the recommended limit-setting process must proceed with some urgency and that we need buy in from other sectors of the agricultural community as well as from dwellers in urban settings.

The NZFSS has lobbied its parent body, the Royal Society, to support it by being part of the Parliamentary Speaker's Science Forum which is attended by parliamentarians. After lobbying to have the Society engaged to be part of the series, the Royal Society independently engaged two people to speak on freshwater issues. Fortunately one of these people was one of our own members, Dr Susie Wood, who was belatedly able to promote the activities of our society to politicians. Once again we, however, have had poor representation from our parent body and this repeated occurrence brings into question the commitment to, and value gained from RSNZ.

On a different note, it is a great pleasure to announce the award of the NZFSS medal to Professor Carolyn Burns, for outstanding contributions to freshwater sciences. Carolyn has been a long-serving member of our society and has provided outstanding academic leadership with major contributions to professional societies including a term as president of the International Society for Limnology (SIL), providing original and ground-breaking research into the size-efficiency hypothesis based on *Daphnia*, as well as mentoring and supervising many post-graduate students. The award will be presented at next year's conference.

A number of people have continued to make significant contributions to, or on behalf of, our society over the past year. Whilst Jay Piggott is located offshore, he continues to

manage our web site and provide timely electronic updates to our society. Kati Doehring and Natasha Petrove provide us with a highly professional newsletter. I have also nearly completed a small project to get all of our past newsletters into electronic form so that they may be a permanent electronic resource accessible from our web site. And we owe special thanks to Kate McArthur who has done a fantastic job with almost single-handedly coordinating our society's response to MfE in relation to the government reforms relating to both the RMA and Freshwater.

With regard to the present conference, special thanks to Kevin Collier and our other freshwater members, Natasha Grainger, Erina Watene-Rawiri, Brendan Hicks and Nick Ling, as well as the professional conference organisers On Cue. These people have done a wonderful job with sponsorship, plenary speakers and the programme generally.

Lastly, and following on from our tribute to Stephen Moore in this year's conference, I wish to acknowledge throughout his working career his dedication and commitment to advocacy, communication and photography related to stream ecology. NZFSS members pass on their condolences to Stephen's wife Ruby and children Alexis and Bernice.

I move from the chair that this report be accepted (*Brian Sorrell – carried*).

5. Secretary-Treasurer's Report:

MEMBERSHIP

Total membership at 1 August was 502. Membership figures for the last five years are shown in Tables 1 and 2. Total membership continues to increase, with increases in both waged (ordinary) and student/unwaged member categories over the last year. Of note are the number of members in arrears by 2 years. This has also increased and this represents members that either are no longer interesting in retaining membership to the Society or who have yet to pay their subscriptions. The membership database is reviewed every three to four years, and those members who have not been financial for more than 3 years are removed. This was last carried out in 2010.

Table 1: Financial status of membership

	2013	2012	2011	2010	2009
Members – Current:					
Paid	248	221	268	148	172
Unpaid	97	120	140	240	163
Members – in arrears:					
1 year	45	103	-	-	36
2 year	83	-	-	-	39
Other:					
Honorary	10	10	11	11	11
Life	4	4	4	4	3
Legal*	1	1	1	1	1
Societies	5	5	5	5	5
Libraries	9	9	9	9	9
TOTAL	502	473	438	418	439

* Not a member; a legal requirement

Table 2: Type of membership

	2013	2012	2011	2010	2009
Ordinary	345	329	304	288	294
Corporate	13	13	15	15	28
Honorary	10	10	11	11	11
Life	4	4	4	4	3
Unwaged/Student	125	112	99	95	98
Other (Societies)	5	5	5	5	5

FINANCES

The following report is unaudited.

The Society continues in sound financial condition and is in a good position to continue supporting its aims. Our total assets (including equity in stock of unsold "Guide to freshwater Crustacea of NZ") at 30 June 2013 were \$72,642. This is an increase from \$67,600 in 2011/12.

We have one term deposit, the combined Jolly Fund, with \$50,303 at 30 June 2013. The Current Account was at \$12,604 at 30 June 2013.

Income: A small profit was made in 2012/13 with our net income \$1,823. Subscriptions was our greatest single income item in 2012/13 with this category broken down into Subscriptions Current: \$8,451; Subscriptions in Arrears: \$1,070; and Subscriptions in Advance: \$243. Revenue earned from sales of "Guide to freshwater Crustacea of NZ" in 2011/12 was paid in 2012/13 and this was our second largest income stream with \$2,652 earned from 101 copies sold. Interest on our bank accounts (both current account and our term deposit) was \$1,682.

Income from the 2012 conference paid during 2012/13 was \$600. Additional income from this conference was received in July 2013 (gross income: \$7,190) and this will be reported at the 2014 AGM.

Expenses: The main expenditure item in 2012/13 was conference expenses (\$5,113), followed by fees to the Royal Society of New Zealand (\$1,200). RSNZ fees are calculated at \$4 per waged member, so our subscription to RSNZ is likely to increase this year.

These financial accounts are unaudited (due to Brown Webb Richardson Ltd. advising they are no longer able to perform this function for us). I propose that a new auditor (Angela Wood – Chartered Accountant) be engaged to audit our accounts for 2012–13. The fee is estimated to be between \$1,300 and \$1,700 to conduct the audit, with an additional fee of \$500 to prepare our financial statements.

An option for future financial review of the Society's books is a Review Engagement, with a full audit every 3 years. The estimated cost for this is about two thirds the cost of an audit. But this would require a constitutional change by postal ballot, and it may risk our tax-free status with IRD. Further information on this option will be made available to members later in the year.

I request that the Secretary-Treasurer's report be accepted.

Motion: That Angela Wood – Chartered Accountant be appointed as auditor for FY2013 (*Janine Wech/ Neil Deans*)

Motion: That the Society accounts for 2012/13 be accepted. (*Janine Wech/Brian Sorrell – carried*).

6. SIL 1987 Trust Fund:

Kit Rutherford (Treasurer) presented the (unaudited) SIL 1987 Trust Interim Annual Accounts for 2012–2013.

17/09/2012	NZ Bond Trust (Information about the NZ Bond Trust not available)	ND
17/09/2012	BNZ Ready Money account	\$153.60
17/09/2012	Int. Equity Trust	\$12,563.28
Awards:	No awards were made	
Income:	Estate of the late Vida Stout	\$30,000.00
Expenditure:	Charities Commission	\$51.11
31/03/2013	NZ Bond Trust (Information about the NZ Bond Trust added)	\$17,462.33
17/07/2013	BNZ Ready Money account	\$30,088.60
17/07/2013	Int. Equity Trust	\$15,128.36
TOTAL ASSETS		\$62,679.00
Dividends/Interest		c\$2,599.00
Amount available for awards in 2013–2014		
5% of assets		c\$3,000.00
Plus dividends/interest		c\$2,500.00

The generous bequest from Vida Stout has boosted SIL Trust funds. This was the second time that Vida gave generously to the Trust (a donation received previously from her was recorded as an anonymous donor).

Theoretically, there would be about \$5,500 in awards available next year.

Motion: That the SIL Trust Fund report be accepted. (David Hamilton/Richard Allibone – carried).

7. One Day Workshop – National Objectives Framework:

A workshop (in conjunction with HydroSoc) has been proposed to inform members on the process of limit setting and NOF, with members unable to physically attend the workshop being able to participate via an electronic link. The process for holding the workshop up to now has been delayed, but during the public consultation phase of the process would be a good opportunity to hold the workshop. Discussions from members at the AGM raised the following: what value would there be in having a workshop; who are the key people that would attend; is there value in connecting the workshop via electronic medium; timing in holding the workshop would be critical, with tight consultation and reporting phases; all members are encouraged to share the workload; the NOF is the most significant legislation since the RMA legislation, and so it is critical that freshwater input is heard; need to allow members to voice concerns and remain anonymous; also need to ensure that information is disseminated early to allow adequate representation; need to ensure that enough time is

allowed for workshop discussion; work pressures mean that many members have little extra free time; a senior Ministry for the Environment representative should also be at the workshop; parallel sessions versus one session was raised with the consensus being that one session was more desirable; possibly linking with other societies.

From the above discussion, the following was decided:

- The workshop should be no longer than one day,
- An MfE representative would assist, give details and background documents to participants in advance,
- Timing: ensure enough notice of workshop is given to allow maximum participation
- Assistance to set up the workshop is needed; but first wait for MfE to give go-ahead.

8. Morgan Foundation River Awards – 28 November 2013

The Morgan Foundation (Gareth Morgan) is sponsoring the first annual NZ River Awards in November 2013. This is similar to the International River Foundation and is designed to award for the most improved river in each region, and a Supreme Award for the most improved river in New Zealand. This year's Awards will use *E. coli* data to determine the most improved river as an indicator of river health.

ACTION: David Hamilton to write to Gareth Morgan to offer the Society's support.

9. Succession Planning for Māori Representative

Jane Kitson is stepping down as Māori Representative. Taking her place is Hannah Rainforth. Mahuru Robb continues in the role of Assistant Māori Representative. This is a co-opted member role, so no elections to the position are required. David thanked Jane for her work in the role and welcomed Hannah.

10. Publications

- **Guide to the freshwater Crustacea of New Zealand:** Manaaki Whenua Press are winding up operations so new distributor needs to be found. At present, MWP are in discussions with Lincoln University and Nationwide Distributors (who deal with University of Canterbury) regarding who will continue to distribute all publications by MWP. Our contract with MWP expires in December 2014, so a decision on how to distribute the remaining stock after this will be required.

ACTION: Janine Wech to inquire what electronic resources (i.e., files that went to the printers) MWP hold that are NZFSS publications, and retrieve for the Society to hold.

- **Freshwaters of New Zealand (second edition):**
 - Progress around getting FONZ (2nd Ed.) ready for publication has slowed while waiting for follow-up from HydroSoc.
 - PDF's of FONZ (1st Ed.) have been found, so no need to get organised this to be done. The next stage is making these available on the web.

11. Data Repository for Information such as Expert Evidence – RSNZ Site

RSNZ hosts our website and could potentially also be used to store large amounts of electronic information, such as expert evidence (an idea brought up in the past by Rasmus Gabrielsson). Members discussed the issues in following this up, including: expert evidence is opinion-based; expert evidence is also currently available through the Freedom of Information ACT and regional council websites (although this is not a permanent storage option); maintenance of files would be required (i.e., it is resource-hungry); it could be an inefficient way to keep this information. The discussion concluded that there was no clear path forward, so no action required.

12. Future Conferences

2014 conference will be held jointly with HydroSoc in Blenheim from 24 to 28 November. Pete Hamill (from Marlborough District Council) is the organising chair. On Cue have been booked as the conference organisers.

2015 conference: ASL are due to visit NZ, and a venue in the North Island needs to be found. Any volunteers to contact the Executive.

13. General Business

- **Kate McArthur:** call for volunteers to help with making submissions with reviews coming up (e.g., RMA), specifically with drafting responses, getting opinions of members and collating for submission. Dean Olsen and Jane Kitson indicated they would be available to help.
- **Clive Howard-Williams:** Catchments Technologies Conference will be held in Hamilton in November 2014. The conference is to disseminate information on technologies to mitigate agriculture and diffuse sources of nutrients. The conference was last held in Italy in 2011.
- **Kati Doehring:** Suggested having a closing media statement to inform the public on what we think about the state of the environment, possibly a joint statement with the Marine Society.

ACTION: David Hamilton to draft media statement with Marine Society and circulate to members.

Further discussion was as follows: suggestions that the interface (estuaries) needs work; that media statements are good only for the day of release to the press, so should it be sent to politicians?; however, last year's media statement has lasted well, and it remains on our website; the timing of the release is critical, when it is received and acted upon; the independent view is important – that it is a statement by scientists rather than an organisation; we could champion an urban streams accord and promote this to regional councils (similar to the dairy accord), setting a series of targets for regional councils.

The meeting closed at 5:30 p.m. ■

ABOUT THE NEW ZEALAND FRESHWATER SCIENCES SOCIETY

The New Zealand Freshwater Sciences Society (NZFSS) began as the New Zealand Limnological Society (Limsoc) founded in 1968. It adopted a new trading name in 2005 to reflect the broad interests of current and new members whose interests span freshwater science, education, conservation and management. The society aims to:

“establish effective liaison between all persons interested in any aspect of fresh and brackish water research in New Zealand, and to encourage and promote these interests”

The society achieves this by:

- holding workshops and annual conferences
- co-operating with other scientific bodies (see links to related sites)
- producing one newsletter per year
- maintaining a membership register
- communication through emailing list and public forum for members
- listing members' interests
- listing relevant publications

Constitution

1. The name of the Society shall be the New Zealand Limnological Society Incorporated.

2. Objectives: To establish effective liaison between all persons interested in any aspect of fresh and brackish water research in New Zealand, and to encourage and promote these interests.

3. Means of Attaining Objectives:

- (a) The establishment and maintenance of a register of all persons working in the appropriate fields in New Zealand, giving details of their current interests.
- (b) The holding of meetings and conferences to deliver scientific papers, and to discuss scientific topics.
- (c) Co-operation and affiliation with other scientific bodies when appropriate.
- (d) The production of a newsletter including information about the current interests of freshwater workers, and listing relevant new publications and other items of interest.
- (e) The distribution of the Newsletter to appropriate organisations in New Zealand and overseas.

4. Membership:

- (a) **The members** of the Society shall be:
 - 1 Ordinary members who shall be persons admitted to membership by the committee, and whose annual

subscription as fixed from time to time shall be accepted by the Committee.

- 2 Unwaged Members who shall be any full-time student of a secondary or tertiary educational institution, and who shall pay such annual subscription as shall be fixed from time to time.
- 3 Honorary Members who may be elected at a general meeting on the recommendation of the Committee.
- 4 Life Members who shall be persons admitted to membership by the committee, and whose lifetime subscription shall be paid in advance as a single fee as fixed from time to time.

- (b) Newly elected members shall be **notified** by the Secretary of their election and sent a copy of the constitution.
- (c) Any member may **resign** by giving notice in writing to the Secretary, and paying all subscriptions due.
- (d) Any member shall notify the Secretary in writing of a **change of address**.
- (e) The Committee shall have the power to **cancel membership** in the case of conduct considered prejudicial to the Society.
- (f) All members are entitled to receive the Society's **Newsletter** free of charge.

5. Executive and Meetings:

- (a) There shall be an **Executive Committee** consisting of the President, the immediate Past President (*ex officio*), the Secretary-Treasurer, the Editor, and two (2) other members,
- (b) The Committee shall implement the Society's general business, and a simple majority shall decide all questions at Committee Meetings. If voting is equal, a motion is lost. A quorum at a Committee Meeting shall be three (3).
- (c) The officers shall be **elected** every two years, either at a General Meeting or by postal ballot as the existing Committee determine. The postal ballot shall be held before the end of the financial year, and if a General Meeting is not held, the committee shall have the power to scrutinize and count the votes, and declare the results.
- (d) The newly elected officers shall take office one (1) month after their election.
- (e) **Candidates** for positions as officers shall be nominated at the General Meeting, or in writing signed by two other members, received by the Secretary before the time of such meetings, or by the 31st of August if a meeting is not held. Every candidate shall signify

personally, or in writing his or her acceptance of nomination. The Committee shall have the power to co-opt members of the Society to fill any casual vacancies on the Committee.

- (f) The Executive Committee may summon a **General Meeting** or a General Meeting shall be summoned on receipt of a request signed by no fewer than ten (10) members entitled to vote. General Meetings shall be summoned by notice in writing, specifying the business to be considered, and notices shall be posted not less than fourteen (14) days prior to the proposed date.
- (g) At all General Meetings, ten (10) members entitled to vote shall constitute a **quorum**, and a simple majority shall carry a motion. Voting shall be on the voices, or by show of hands or by ballot at the discretion of the chairman, provided that, if any member so demand, voting shall be by ballot. The Chairman shall have a deliberative and a casting vote.
- (h) **Votes of members:** Each Member shall have one (1) vote at a General Meeting, and each Affiliated Body shall have the right to appoint a delegate who shall have one vote at a General Meeting.

6. Finance:

- (a) **Annual Subscription:** shall be due on the 1st of July in each year and the amount shall be fixed at a General Meeting. Members whose subscriptions are not paid by the succeeding 30th of June shall be unfinancial and shall be liable to forfeit all benefits of membership. The financial year shall conclude on the 30th of June.
- (b) **The funds** of the Society shall be controlled by the Executive Committee and shall be banked in the name of the Society. Cheques and bills shall be signed by any one of the President or Secretary-Treasurer, and must be approved in writing by other members of the Executive Committee. The Society shall not have the power to borrow money.
- (c) Any income, benefit or advantage shall be applied to the **charitable purposes** of the Society as described in Sections 2 and 3 above.
- (d) No member of the Society, or any person associated with a member, shall participate in or materially influence any decision made by the Society in respect of the payment to or on behalf of that member or associated person of any income, benefit or advantage whatsoever.
- (e) Any such income paid shall be reasonable and relative to that which would be paid in an arm's length transaction (being the open market value).
- (f) The provisions and effect of clauses 6(c), 6(d) and 6(e) shall not be removed from this document and shall be included and implied into any document replacing this document.
- (g) **Payment of accounts** must first be approved by the Executive Committee. This may be done at a meeting or by mail, and items may be approved in advance for one financial year.
- (h) **An Annual Report and Financial Statement** shall be prepared and posted to members. The Financial Statement shall be audited by a person appointed at the previous General Meeting.

7. Organisation:

- (a) The Secretary-Treasurer shall keep (i) a **Minute Book** containing full minutes of all meetings, and (ii) a **Register** with the names, addresses, professional interests and date of joining of all members.
- (b) **Affiliated Bodies:** Incorporated or unincorporated bodies, and other organisations approved by the Committee, may become affiliated with the Society on acceptance by the Committee, and on payment of such annual subscription as may be fixed from time to time.
- (c) **Changes in the Constitution** may be made only on a two-thirds majority of the votes polled, and this vote shall be conducted by letter.
- (d) No addition to or alteration or recession of the rules shall be approved if it affects the **charitable objects**, the **personal benefit clauses**, or the **winding up clause**, except as specified under clause 7(g) below.
- (e) **The Common Seal** of the Society shall be in the custody of the Secretary, who shall in pursuance of a resolution of the Committee to that effect, affix the same to all instruments requiring the same.
- (f) The Society shall not be wound up except on a two-thirds majority of a postal vote, but shall be dissolved in the event of the membership being fewer than five (5) persons. In the event of **dissolution** of the Society, its assets shall become the property of the Royal Society of New Zealand which shall dispose of the assets in accordance with the aims of the Society.
- (g) The provisions and effects of this clause 7(f) shall not be removed from this document and shall be included and implied into any document replacing this document, except that another organisation, which must be an **Inland Revenue Department approved charitable organisation**, may be named in place of the Royal Society of New Zealand.

Membership

Membership is open to anyone with an interest in freshwater sciences, management and education in New Zealand and internationally. Members are entitled to attend the annual Society conference and associated workshops on topical issues, and to receive an annual newsletter detailing recent work at research institutions, members' addresses and interests, and recent publications. The Society administers grants for conference travel and visits by overseas scientists through the SIL Trust Fund. The Society also makes submissions to government bodies on behalf of members.

The Society currently has over 350 members coming from a wide range of backgrounds, including research institutes, regional and district councils, government environmental and conservation organisations, universities and consultancies. Members' freshwater interests include:

- Native freshwater fish
- Sports fishery management
- Aquatic invertebrate ecology
- Zooplankton and phytoplankton taxonomy and ecology
- Macrophytes and periphyton ecology
- Lakes, rivers and wetlands

- Water quality management
- Aquatic biosecurity
- Human perceptions of water
- Conservation and restoration of freshwater ecosystems
- Resource management
- Science education

To become a member, please fill out the membership application form and post or email this form to the Society Secretary-Treasurer.

Executive & Meetings

See page 3.

History of NZFSS

New Zealand Freshwater Sciences Society was founded in 1968 by a group of freshwater scientists interested in maintaining links in their field. It was also a time of increasing public interest in the management of freshwaters with lake weed and eutrophication issues in several areas, the newly passed Water and Soil Conservation Act 1967 and the first national environmental campaign to 'Save Manapouri' questioning further hydroelectric power development. Society membership remained relatively small during the 1970s, with annual conferences held throughout the country attended by about 30 members to discuss research and provide opportunities to visit areas and collect samples.

By the late 1970s and early 1980s, New Zealand was considering various options for future freshwater management during the 'think big' era which led to an increase in freshwater investigations and reviews of freshwater policy as well as research opportunities. This time was characterised by the management issues including development of the MCI and national debates about 'wild and scenic' rivers. A highlight for the Society at the end of the period was the highly successful running of the SIL conference in 1988 in Hamilton, the first of these to be held in the southern hemisphere.

By the late 1980s environmental and tertiary education reviews were affecting the context for education, research and management. This culminated in the reorganisation of water management through the Resource Management Act 1991, with the associated demise of considerable central government funding, the National Water and Soil Conservation Authority, DSIR and Water Quality Centre, environmental government departments, catchment boards and Acclimatisation Societies and their replacement with the Ministry for the Environment, NIWA, Department of Conservation, regional councils and fish and game councils, respectively.

The 1990s saw the decentralisation of freshwater management and a growing proportion of society membership made up of local and central government officers and policy makers, as well as significant increases in under- and post-graduate student numbers with expanding Universities. Society membership expanded steadily through this period. The importance of freshwater as an economic

and environmental resource has remained high, with considerable expansion of water use and concerns about environmental degradation. Water management has become more sophisticated through regional plans and more complex requirements on water users through resource consent processes.

Over the last 10 years the economic value of water has increased in proportion with its perceived scarcity, with increasing concerns expressed about maintenance of water quality with increasing intensification of land use. Development of complex modelling of, for example, effects of river flow changes on biota, pollutant transport, landuse effects on water, has challenged freshwater scientists to provide answers to complex technical issues. Society numbers have continued to steadily grow, with more emphasis on liaison, education and policy and better links with other societies, especially with the Australian Society of Limnology with which the Society has joint conferences every four years since the first joint meeting at Wairakei in 1999. About a quarter of Society members are students, with about a third practising scientists in research institutions or Universities, a third working for regional or central government and the remainder in consultancy, other education or advocacy.

Honorary & Past Members

See page 3.

NEW ZEALAND
Freshwater Sciences Society
MEMBERSHIP APPLICATION



How do I Join?

Print/pull out this page, fill in your details, then post to:
Janine Wech, NZFSS Secretary-Treasurer, c/- NIWA, PO Box 8602, Riccarton, Christchurch 8440
or email to: Janine.Wech@niwa.co.nz.

DETAILS:

Title..... First Name..... Middle Initial/s..... Last Name.....
Postal Address.....
.....
Email.....
Telephone: (main)..... (alternate).....
Membership Type: (select one) Waged Student Unwaged
Brief list of your professional interests:.....
.....
.....

PERMISSIONS: (Please select your preferred option for the following and sign to authorise)

I agree to the NZ Freshwater Sciences Society **publishing my membership details:**

Yes No Signature.....

I give permission for my **email address to be added to the NZFSS email mailing group:**

Yes No Signature.....

My preferred format for **receiving the NZFSS newsletters** is:

Hardcopy PDF – via email Signature.....

PAYMENT: (Please select appropriate boxes)

Waged/Corporate \$55 per annum Unwaged/Student \$15 per annum Life Membership \$1375

Donation to the SIL Trust* (optional) \$4

Total Amount \$.....

Payment by Cheque – Make payable to “NZ Freshwater Sciences Society”

Payment by Direct Credit – Acct: BNZ 02-0700-0354213-00 (include your last name in the Reference/Details field)
Date paid.....

Payment by Credit Card (please tick one) Visa Mastercard
Name on Card..... Card Number.....
Card Expiry Date..... Signature of Cardholder.....

Please send completed form to: NZFSS Secretary-Treasurer (details at the top of this form).

* The SIL 1987 Trust supports overseas travel awards for beginning NZ scientists and guest lecturer visits to NZ by eminent international freshwater scientists.
See www.freshwater.science.org.nz for more details.



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