

New Zealand Freshwater Sciences Society Newsletter



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1 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 2013 subscription is \$55.00 per annum, or \$15 for students, the unwaged or retired persons. Committee members for the 2011-2012 period were:

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2012 Conference Convenor

Not applicable – joint conference with the Australian Society for Limnology

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2 Editorial

“Scientists needed please – apply at your local catchment group”

I was fortunate enough this year to become involved in the Land and Water Forum, after the iwi member from Whanganui left for another job and asked me to take over for her. It was a time-consuming, but rewarding, process. I can't imagine another situation that would lead me to have detailed, and convivial, conversations with proponents of irrigation, horticulture and dairy farming. I'm sure you've heard enough over the past few weeks and years about the positives of collaboration, so have no fear, it is not my intention in this editorial to espouse its virtues (although I do support the process). Instead I want to reflect on the need to support the process with science.

Science was well incorporated into the Land and Water Forum process, with papers commissioned for various working groups, presentations given, and the attendance of some senior scientists at many (but not all) of the sessions. Even so, there were times when those scientists were unavailable (as they are, understandably, rather busy people and cannot attend every meeting) – and those times showed the importance of having such people involved.

In their absence, there were questions that arose, uncertainties that needed clarifying, and debates that roamed, sometimes circulating like an unstratified lake. These discussions were often necessary, and I believe we got there in the end, but I do think we could have flowed a little more like a river and avoided a backwater or two had a senior scientist been present at those times.

Modelling was a particular concern raised in the discussions, with doubt expressed about the certainty or applicability of models. This is valid, given that all models have limitations and are only as good as the data they are built on. However, having people on hand to explain what the certainties and uncertainties mean, how those uncertainties are understood, and how we are able to work within those uncertainties may have circumvented a few eddies. It may be that how models work was explained before I joined the group, but in some ways this only confirms the need for continued input, as there were certainly still questions burning when I joined the Forum.

Information on what monitoring is currently possible is also needed on hand during collaborative processes. Obviously not every monitoring technique can be covered in one presentation, so having the ability to touch base with an experienced person is useful as discussions meander over what is feasible and useful in the monitoring world. An RMA planner and a hydrologist wouldn't have gone amiss either. There were times when we were heading in directions that were simply not consistent with current laws, and it wasn't until someone with experience in RMA statutes intervened that we were able to get clarity and come back on track.

This need for technical input is particularly important for us as freshwater scientists, especially as there is a push for more collaborative processes throughout the planning framework. LaWF is asking communities to determine local catchment standards and to work collaboratively on their regional plans. Now, more than ever, communities need science input. Imagine each community across the country grappling with



Hannah Rainforth
Outgoing Editor

the issues LaWF has wrestled with over the past four years. Imagine what it will be like for iwi, growers, farmers, campers, fishers, and power users to be faced with determining how to manage the water around them. It is a daunting task, and they will have to understand some complex issues, techniques and methods. It is certainly not a time to write scientists out of the picture – indeed there will be a pressing need to utilise the knowledge and expertise scientists hold. We scientists have long stated that we need to communicate our findings better with the wider community. Being available in collaborative process is a powerful, and deeply crucial, way to do this, especially with groups who may have traditionally been less than receptive, and in a forum that is by necessity framed with more openness than the current hearings-based system.

Obviously, not every collaborative process is going to be able to access a planner, a hydrologist and a scientist experienced in modelling and in all aspects of water quality monitoring (there are just not enough of these people to go around). However, a few key lessons emerged for me as a result of participating in the Forum:

- we as scientists need to make ourselves as available as humanly possible to participate in collaborative processes;
- the community need clear explanations of what models are, how they work, and what it means to work with the model's uncertainties;
- collaborative groups should take time out to seek answers from local scientists when they are unsure on an issue; and lastly
- science doesn't communicate itself – we as scientists need to do this for our communities.

So put your hand up and participate in your local catchment group – they'll need you!

But before I sign off, I would like to thank and acknowledge all of you who have contributed to this newsletter. Responses have been fantastic, as you can see by the size of this year's newsletter. A special thanks goes to **Kati Doehring**, who for the last two years has been the assistant editor on the newsletter. Kati has been a never-ending source of encouragement and enthusiasm, as well as providing a wonderfully organised base text in amazing time. She has diligently sought contributions from you all, and chased up many loose ends to ensure all the necessary content is included. Thank you Kati – your work is deeply appreciated.

Nāku noa,
Hannah





3 President's piece

I want to begin this column with an acknowledgment to Dr Vida Stout, a founding member and first President of the New Zealand Limnological Society (1967). Vida died in July after a long battle with Parkinson's disease. She retired in 1996 but even in 2004, and despite advanced Parkinson's disease, I recall her participating in every session of the International Society for Limnology (SIL) Congress in Lahti, Finland, after travelling to Finland unaccompanied. Vida retired from the University of Canterbury in 1996 but was almost always on campus until interruption by ill health. After completing her Ph.D. at the University of London, Vida took up an appointment in 1957 as Assistant Lecturer in Zoology at Canterbury University. Her research at Canterbury flourished, with pioneering work on South Island lakes, many in remote locations. This work certainly influenced my own thinking on the processes and functioning of deep New Zealand lakes. Vida eventually attained the distinguished position of Reader in Zoology at Canterbury University but remained very active with administrative functions in the university and, of course, in the New Zealand Limnological Society. She was a loyal servant of the society and will be fondly remembered by many in the current New Zealand Freshwater Sciences Society.

I recently had the opportunity to attend the Aquatic Sciences Meeting of the Allied Sciences for Limnology and Oceanography (ASLO – formerly the American Society of Limnology and Oceanography), in Biwako, Japan. The Japanese were fantastic hosts and the meeting had a truly international flavour, with many excellent talks. The scientific content was aided by many special sessions being led off by 'tutorials' in which a prominent scientist outlined the current status of research in the field. A prominent theme repeated many times through the conference was that we are now in the 'age of the anthropocene'. Humans are the dominant drivers of aquatic ecosystem change around the world. Presentations demonstrated how overgrazing, desertification and dust storms in China can ultimately contribute to phosphorus deposition and increasing trophic status of iconic Lake Tahoe in the California/Nevada, USA; how nitrous oxide emissions from vehicles are increasing nitrogen inputs to remote lakes in alpine regions and stimulating eutrophication; how increased CO₂ is leading to ocean acidification; and of course, in our increasingly globally-connected world, how we are translocating species across continents at unprecedented rates.

It follows that in the face of these global pressures (eg, climate change, rising ocean water levels and invasive species) that we must turn inward to ensure our local ecosystems are resilient and afforded a level of protection that makes them less vulnerable to degradation. The Land and Water Forum (LAWF) has been strongly commended for its recommendations to government on reforms to the water industry and policy that are designed to support protection and restoration of waterbodies. LAWF consists of 21 stakeholder organisations that meet monthly as well as 30 other organisations and several observers from local and central government. Aside from recommendations on setting limits on water resources (both use and discharge of water) the Land and Water Forum is promulgating a model of collaboration and 'good faith' participation. It has to be said that the Land and Water Forum model 'must' work for the sake of scientists in the New Zealand Freshwater Sciences Society. Why? Because government has devoted considerable resources to bringing together stakeholders in a collaborative decision-making process at a time when funding for water research is limited and strongly contested. Another major challenge for LAWF is to ensure that stakeholders remain loyal to what has been collaboratively agreed to in the forum, and that they not be alienated by their own stakeholder constituents, nor coerced into representing strongly polarised opinions within their own organisations. And of course members of NZFSS will be keen to know what time frames will be associated with implementation of the resource limit-setting recommended by LAWF.

The discussion above leads logically to what is sure to be one of the highlights of this year's conference, namely a plenary address from Alister Bisley, the chair of LAWF. The 2012 NZFSS conference will be held at the University of Otago in Dunedin from 3-7 December. Gerry Closs and his organising team are promising an excellent programme with a theme of 'Beyond the Limits', which aims to stimulate debate about the capacity of our freshwater ecosystems and includes an aligned plenary talk from Mike Joy, the Director of the Centre for Freshwater Ecosystem Management & Modelling at Massey University. Looking further ahead, planning has already commenced for our 2013 conference in Hamilton. Mark the dates of 19 to 23 August 2013 in your diary now for our joint conference with the New Zealand Marine Sciences Society and the Australian Society for Fish Biology.



David Hamilton

President

4 He Maimai Aroha – Farewells

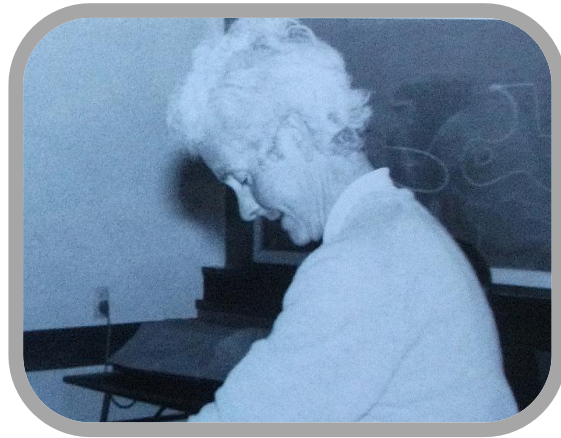
Vida Mary Stout 1930 – 2012

By Mike Winterbourn

Vida was a member of a highly distinguished New Zealand family. Her father was a surgeon and vice chancellor of Victoria University of Wellington and her grandfather was the 13th premier of New Zealand and later chief justice. Her brother John had been a distinguished scientist at the Soil Bureau. Vida was dux at Woodford House before going to Victoria University where she did her BSc and MSc in Zoology. Her thesis was on the two large red water mites found in ponds. She wrote two long papers on mites from her thesis and another on the rhabdocoel flatworm *Mesostoma* – all were published in the Proceedings of the Royal Society of New Zealand. She then went to Bedford College, University of London where she did her PhD on *Daphnia*. This was followed by post-doctoral work in Sweden before returning to New Zealand. In 1968 she and the late Ann Chapman founded the New Zealand Limnological Society (now the NZ Freshwater Sciences Society) as a forum where freshwater workers could meet at an annual conference and contribute to a newsletter. Vida was the first president of the Society and Ann was the first newsletter editor. The Society, now in its 44th year is one of their greatest legacies.

Vida was appointed to the staff of the Zoology Department, University of Canterbury in 1958 and remained there until her retirement in 1996. She was then a Reader (Associate Professor) and had been Dean of Science and Deputy Chair of the university's Academic Administration Committee. She played a significant

role in establishing a new Masters course in Environmental Science at Canterbury and spent some years as a member of the South Canterbury Conservation Board. Vida supervised the research of numerous students and always put their interests first. Her first PhD student was Doug Craig who studied blepharicerid midges. Other doctoral students she supervised were Jim Robb (midges), Derek Staples (bullies), Paddy Ryan (eels), John Hayes (trout), John Stark (lake-weed fauna), Laorsri Sanoamung (rotifers), Janet Wilmshurst (lake palaeobiology) and Barbara Schakau (midges in lake sediment cores). Brian Timms undertook a post-doctoral fellowship under her direction and used it to make extensive studies of the benthic invertebrate communities of South Island lakes. Vida also supervised Masters and BSc (Honours) students on a wide variety of topics, including mammals, water birds, fish and various aspects of the ecology of lakes and ponds.



also



Left: Vida instructing students at a tarn in Arthur's Pass about 1995

Vida's own research resulted in the compilation of important, pioneering information on the biology and chemistry of South Island lakes. She was most interested in the nature of zooplankton communities, their changes over time, and their relationships to eutrophication, land use and hydro power developments. She visited a vast number of South Island lakes, and had a happy knack of convincing people to take her to remote places. She also undertook long-term studies on lakes Grasmere and Pearson in the Cass area of inland Canterbury, and in the 1960s and 70s wrote timely reviews and book chapters on freshwater biology in New Zealand. She introduced numerous students to the study of lakes by employing them to identify and count plankton and accompany her in the field. Fieldwork was undoubtedly one of her greatest pleasures and she got much enjoyment from the weekends spent at Cass with the 4th year limnology classes. These often featured vigorous tramps to lakes and streams, an oft remembered example being the epic 14 km Lake Blackwater expedition of 1979 in a howling norwester (see photo). Vida was an enthusiastic member of SIL, the International Limnological Society, and rarely missed its triennial conferences. She regularly gave talks on her New Zealand work and many of her research papers were published in the SIL proceedings. Her most frequently cited paper is "Lakes in the mountain region of Canterbury, New Zealand" *Verh. Internat. Verein. Limnol.* 17: 404-413 (1969). She was a life member of the Freshwater Biological Association (UK) and was an honorary life member of our Society.

In addition to her consuming interest and involvement in teaching, research and administration at the University of Canterbury Vida was an active member of the United Tennis Club for many years. She also played badminton when younger and must have inherited her well developed "ball sense" from her mother who had been New Zealand amateur golf champion. Some years after her retirement she developed debilitating Parkinson's disease and died in Christchurch on 21 July 2012 aged 82.



Exhausted members of the Lake Blackwater expedition, Cass (1979). From left, John Stark, Richard Rowe, Lynley Pearce, John Hayes, Brian Timms, Vida, Malcolm Forster, Mike Winterbourn.

4 Invited articles and opinion pieces

4.1 *Prorhynchus putealis*: range expansion and call for observations

By Duncan Gray* & Christopher Laumer*²

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Prorhynchus putealis (Haswell 1898, Percival 1945) is a sparsely-known, phreatic flatworm (Order Lecithoepitheliata) indigenous to New Zealand (Figure 1). To date it has been found in samples from deep groundwater wells, the hyporheic zone of upwelling river reaches, and at the source of springs where fine sediments are absent (Figure 2). Unlike other lecithoepitheliates this enigmatic, horned, white worm can reach several centimeters in length, although when disturbed there may be violent elongations and contractions. Isotopic analysis shows the worm to be a predator, feeding at the top of the invertebrate food web in a typical alpine spring (D.P. Gray Unpublished Data) and in some of these springs densities may reach tens of individuals per m². Yet little account of this taxa is taken in ecological studies made in suitable habitats and it is not unusual for *P. putealis* to be absent from the species lists for locations where it is known to occur. The most likely explanation for this absence is that *P. putealis* is delicate and stenothermic, prone to disintegration under a slight, rapid rise in temperature (Percival 1945). Its basic morphology can be preserved with absolute ethanol (although formalin-based fixatives are necessary for taxonomic study). Even preserved specimens, however, can withstand little abrasion or impact, and near-complete destruction of specimens is common during conventional benthic sampling. This, in addition to its subterranean habitat, may explain why so little is known about the life history or habits of this species.

In an attempt to better understand the natural history, systematics, and population genetics of *Prorhynchus putealis*, we have been engaged in a broad-scale sampling effort of new and known populations of this species throughout New Zealand. A particular focus has been to discern the nature of dispersal via groundwater pathways within and between braided river floodplain systems. The previous known range of *P. putealis* was limited to the upper Waimakariri River, central Canterbury Plains, and a number of sites on the Southland plains. However, our investigations of springs in braided rivers have revealed a much more continuous and extended range, with new collections from the Clarence, Wairau and Buller rivers, and down the West Coast as far as the Waitaha River (Figure 3). Sadly, we have been unable to find worms in Southland, despite several attempts, and beyond casual inquiries with local phreatophiles, the North Island has so far been neglected.



Prorhynchus putealis (backlit) showing typical morphology. Note distinctive horns and semi-translucent body.

Nonetheless, our results to date indicate several features that perhaps reflect the biogeographic and ecological history of this phreatic species. Sequence data from two mitochondrial genes separate our collections, all ostensibly *P. putealis*, into at least 5 deeply divergent groups, perhaps pointing to widespread cryptic species. Because these results presently come only from mtDNA, we are investigating another source of information to inform the possible division of *P. putealis* into a species complex. An anatomical study of vouchered specimens from throughout our samples is underway, using a micro-computed tomography (microCT) approach to rapidly observe the internal morphology of specimens (Figure 4). By comparing samples within and between each putative species we hope to discern internal morphological characters, (eg distribution of testicular follicles, proportions of the pharynx) that corroborate a division of *P. putealis* into a species complex.

However, at several locations, our genetic analyses have also shown sympatric (within the same catchment) occurrences between these otherwise deeply divergent groups. This adjacent catchment paraphyly may be interpreted as evidence for cross-catchment, or alpine, directional dispersal; a seemingly unlikely feat for a creature with such a delicate disposition. So, what are dispersal pathways potentially open to a stygobiotic flatworm? One appealing idea is that of the 'hyproheic corridor', as coined by Stanford & Ward (1993). In areas with low connecting saddles, particularly with considerable deposits of scree material, it is conceivable that continuous groundwater habitats may link catchments and permit occasional dispersal

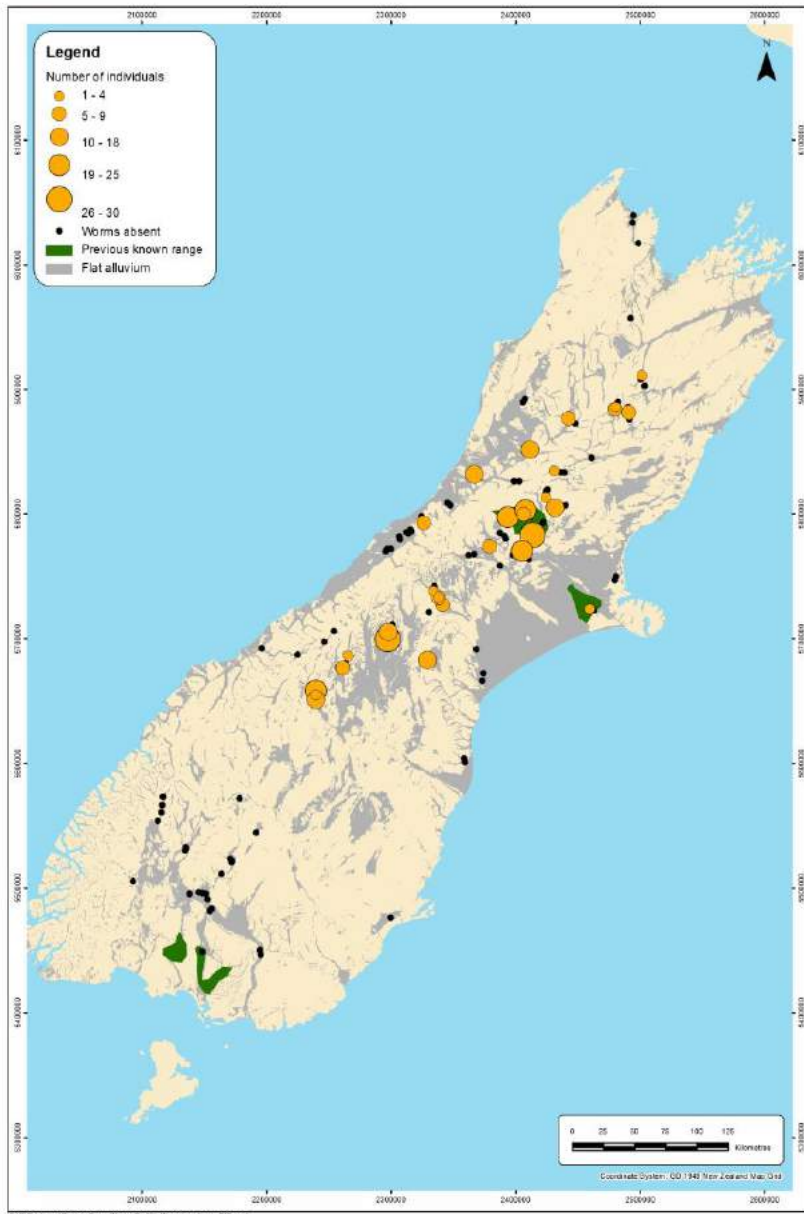


A pair of large *P. putealis* amidst typically clean gravels with strong upwelling water, Hawdon Valley. High stability of sites is indicated by moss growths and *Callitriche sp.*

events. A complementary mechanism, known to have influenced the distribution of galaxid fishes in New Zealand (Burrige *et al.* 2006), is that of drainage evolution. Specifically, river reversal or headwater capture may have provided a dispersal opportunity for *P. putealis* between several catchments in our study. While we are still at an early analytical stage with this project our existing results align closely with putative river capture events identified by both geological and ecological evidence.



Left: Virtual sagittal section of a *Prorhynchus putealis* specimen from microCT data, preserved in Bouin's fluid (penis stylet ejected through mouth during fixation). Anterior tip on upper left corner.



If anybody has seen one of these worms we would be very interested to hear from you. The most likely North Island locations will have substantial areas of Greywacke alluvium containing stable, un-polluted aquifers. The Ruataniwha plains and streams draining either flank of the Tararua Range are potential areas of interest. *Prorhynchus putealis* has thus far not been associated with karst (we could not find it in North West Nelson) or volcanic springs, but these habitats are surely worthy of investigation.

References

Burridge CP, Craw D, Waters JM 2006. River capture, range expansion, and cladogenesis: the genetic signature of freshwater vicariance. *Evolution* 60: 1038-1049.

Haswell WA 1898. On a Prorhynchid Turbellarian from deep wells in New Zealand. *Quarterly Journal of Microscopical Science* 76.

Percival E 1945. The genus *Prorhynchus* in New Zealand. *Transactions of the Royal Society of New Zealand* 75: 33-41.

Stanford JA, Ward JV (1988). The hyporheic habitat of river ecosystems. *Nature* 335: 64-66.

4.2 Stealthily slaying the RMA?

By Kate McArthur

The Catalyst Group

Whether we are academics, students, researchers, consultants or in government, unless we have been very naughty our involvement in freshwater science comes into contact with the law via the Resource Management Act (RMA, 1991). In February, a report was released that proposed a significant shift in the focus of resource management and decision making. While the purpose of the Act is not proposed to change, the Part 2 principles in sections 6 (matters of national importance) and 7 (other matters for particular regard) are being reviewed through the Government's RMA reforms begun in 2009. The scope of the MfE appointed Technical Advisory Group (TAG) was to provide independent advice on changes to sections 6 and 7 to improve the Act, in line with the Government's environmental and economic objectives and in the same vein as the streamlining reforms of 2009. Key recommendations included:



- Adding the management of natural hazards and urban infrastructure;
- Shifting the focus of the Act's principles from largely biophysical matters to social, economic, cultural and health and safety issues;
- Changing the 'environmental bottom line approach' to a 'broad overall judgement';
- Deleting some principles, particularly reference to the habitat of trout and salmon; and
- Adding timely, efficient and cost-effective decision-making, plain language, limits on environmental compensation, collaboration within local government and recognition of private property rights.

Will the proposed changes really improve outcomes after events such as the Canterbury earthquakes? What are we risking by 'fiddling' with the Act's principles, particularly those pertaining to freshwater? Are we ready to lose the influence of Fish & Game from freshwater resource management in New Zealand? And, given recent cuts to the Department of Conservation's RMA work, who will take up the challenge of advocating for our freshwater environments and those who value them? Do we need legislation to elevate socio-economic interests over the environment? Or will pro-development interests look after themselves, as they always have?

In response, the Environmental Defence Society (EDS) teamed-up with other non-government groups (WWF, Forest and Bird, Fish and Game, Ecologic and Greenpeace) to put an alternative view to the Minister. The collective argued that the recommendations will introduce considerable uncertainty about what the Act is trying to achieve and will lead to lower environmental standards. Removing the terms 'protect', 'preserve', 'maintain' and 'enhance' will lead to environmental degradation, eliminating references to the habitat of salmon and trout and restricting provision for aquatic habitats to 'significant habitats' and their 'physical qualities' will also lead to further degradation of freshwater and the new principles would fundamentally change the purpose of the Act 'by stealth'. Overall, the group found that the costs of the changes would be significant, the benefits few and they considered the recommendations were a 'Trojan horse' for reducing environmental standards and the quality of life New Zealander's enjoy.

So I ask: is a review of Part 2 needed or should we apply the "if it ain't broke, don't fix it" principle? The alternative TAG report cited several examples of Environment Court decision-making that utilised Part 2 of the

Act to good effect. In the Manawatu-Whanganui Region we have our own example in the Environment Court decision on the One Plan, which used the principles of the Act when it determined the following:

“We should immediately say also that we have little sympathy for the line of argument that we should defer taking decisive action in the field of improving water quality (or, at the very least halting its further decline) because ... the science is not sufficiently understood ... or that ... further analysis could give a more comprehensive process ... or similarly phased excuses for maintaining more or less the status quo. We will never know all there is to know. But what we undoubtedly do know is that in many parts of the region the quality of the natural water is degraded to the point of being not potable for humans or stock, unsafe for contact recreation, and its aquatic ecosystems range between being sub-optimal and imperilled. We also know what is causing that decline, and we know how to stop it, and reverse it. To fail to take available and appropriate steps within the terms of the legislation just cited (Part 2 of the RMA) would be inexcusable.”

Submissions will be called for if the review becomes a formal process. Don't make the mistake of thinking it is all 'polly-waffle' or that someone else will sort it out. These changes will affect how we work and the environmental outcomes of that work; watch closely and actively participate¹.

4.3 A 'New Deal' for Fresh Water

By Alastair Bisley

Chair, Land and Water Forum

Freshwater is central to our economy, our environment and our way of life. It plays a key role in our identity, our heritage and our recreation and holds particular spiritual and cultural significance to iwi.

To date, wrangling about water hasn't provided much certainty either for investors or for the environment. Frustration with the status quo led 65 organisations across a range of sectors including electricity generation, agriculture, horticulture, forestry, recreation, tourism, mining and the environment to join together with iwi to establish the Land and Water Forum. The Forum was set up as a collaborative approach to make recommendations to the Government on how to reform land and water management. Our recommendations are reached by consensus.

The First Report of the Land and Water Forum, released in September 2010, set out our high-level blueprint for land and water management. In response the Government put in place a National Policy Statement on Freshwater Management (NPS) and established twin multimillion dollar funds for cleaning up waterways and promoting water storage.

The Government also asked the Forum for advice on how to give effect to the NPS. We have therefore worked on two additional reports. The report to the Government released in April this year is about setting objectives for our waterways, limits on takes and discharges to give these objectives effect, and decision-making processes to ensure national and local buy-in. The latest report, released on November 15, discusses the best ways to manage within limits, including allocation issues.

In essence, because our water resources are under more stress we have to manage them more actively and more consistently. We have recommended to the government that it should set bottom-line

¹ The TAG recommendations can be found in the MfE website and the multi-group alternative TAG on the EDS website.

objectives for the state of our waterways across the country, taking account of their different types. They are to ensure that the mana of our rivers is respected – that they have good ecological health, and that they do not endanger human health. Can they sustain fish populations? Will river beds not be choked with algae? Will the water be reasonably clear? And can people have contact with it without getting sick?

We have proposed that local communities should then work with Regional Councils to set objectives and limits which reflect the mix of values and interests in each catchment, respecting of course the bottom lines. They will take account of which waterbodies need to be managed for drinking, or for trout fishing; where swimming is important, and where irrigation, power generation or other economic uses are key.

Finally, in the light of community decisions, Regional Councils will set limits through their planning process, and they will also decide the time-frames within which the limits are to be implemented. Placing the time-frames in local control is an important way of recognising the stake that communities have in these outcomes and the way we transition to them.

Key recommendations propose that Regional Councils use collaborative processes to make these decisions. Based on our own experience, we know that collaboration can help to identify win-wins and produce more enduring outcomes – and community buy-in, without which not much will happen. We recommend that Regional Councils should set these processes up, and that collaboration should be supplemented by high-quality Hearing Panels, to let those not involved in the collaborative process have their say.

Iwi – who are Treaty Partners, as well as significant stakeholders – should be involved at all stages, including in establishing the collaborative processes and in the final decision-making.

This hybrid process – collaboration plus Hearing Panels – that we recommended places the prime responsibility on communities to make plans for water use. We expect that because it is less polarising, there will be less protracted litigation. And although collaborative decision-making is new at the national level (the Land and Water Forum is a ground-breaking institution) at the regional and local level in New Zealand there is already quite extensive experience of this way of doing business.

The third and latest report is about making sure that we have the tools to manage land and water more dynamically. We need both a more healthy environment and to grow the New Zealand economy; so we are looking for approaches that not only will improve the quality of key New Zealand assets – our soil and our water – but also will do so in ways that can lead to substantial and significant economic gains, both for landowners and enterprises, and for the economy as a whole.

We believe we are reaching a “new deal” on fresh water. We agree that water is vital to our economy – to farming, industry and to tourism – and a key element in our prosperity. We know that water quality will vary, and not all streams, rivers, aquifers, lakes and wetlands will be pristine. And we think that this realism will be accepted, provided that the mana of our rivers and their ecological health are protected; provided that we can expect that over time the quality of our water will improve (fishing, swimming and food-gathering are important to many New Zealanders); and provided that there is protection for outstanding water bodies.



4.4 A new record for Campbell Island

By Shelley McMurtrie & Amber Sinton

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As we continue to process the Campbell Island aquatic invertebrate samples, we periodically discover interesting organisms. A recent one is the parasitic fungus called *Coelomycidium* that was found inside *Austrosimulium campbellense* larvae ('sandflies' to most of us). It gives the *A. campbellense* larvae a pretty, marbled patterning, however it isn't such a good thing for the larvae – it will delay their development and cause morphological abnormalities, or even kill them if the larvae are infected early.

Up until now parasitised larvae have only been found in the South Island (with the southern-most record from Dunedin), and are generally limited to higher altitudes where the water is colder. The presence of this fungus on Campbell Island is a new distribution record and the southern-most record for New Zealand.

While the streams on Campbell Island cannot be regarded as high altitude systems (the sites surveyed ranging from 10-250 m ASL), the water temperature is low – an average of 7.8°C based on 15 minute temperature logs from a site 20 m ASL during our two month summer survey period. This is in agreement with the theory that low temperature is a key factor needed for the presence of these parasites.

General information on the distribution of *A. campbellense* larvae and the presence of the *Coelomycidium* fungus on Campbell Island was able to be included in the recent publication by Craig *et al.* (2012)² on New Zealand simuliids, which is available online from <http://fnz.landcareresearch.co.nz>.



The site in Honey Falls stream where the parasitised *A. campbellense* were found (photo taken looking upstream). The site was surveyed on the 15 December 2010.



Top: *Austrosimulium campbellense* infected with *Coelomycidium*, visible as small white 'marbles' under the skin. This specimen was in a sample we collected from Honey Falls Stream, Campbell Island. Bottom: An uninfected *A. campbellense*, collected from

² Craig, D. A.; Craig, R. E. G.; Crosby, T. K. 2012. Simuliidae (Insecta: Diptera). Fauna of New Zealand 68: 336 pp.

4.5 World Class Water and Wildlife

By Mark Solomon

Kaiwhakahaere (Chair), Te Rūnanga o Ngāi Tahu



Ngāi Tahu³ is about to enter the business of irrigation and dairying for the first time as a tribe. This is a significant internal issue for the iwi. We know that we are going to have to stand up to intense scrutiny from both our own people and from others given the value we place on good water quality and the serious concerns that we have with the impact of dairying on lowland waterways. We will have to prove to ourselves and others that we can run a sustainable dairying operation that prioritises the protection of sufficient quantities of quality water and keeps our wild food stocks safe for future generations to enjoy. This is what our elders negotiated for with the Crown in the 1800s and subsequently fought for in our Treaty Settlement process.

In recent years, we have tried hard to articulate how our values, rights and interests have been compromised or lost, but we haven't been so good at presenting solutions or alternatives that actually protect them. By setting up our three pilot dairy farms, we intend to adopt best practice methods and help create standards that better protect those natural resources that give all New Zealanders the quality of life and culture that we all treasure so much. When you consider that in Canterbury alone, our native vegetation is less than 1% of its natural cover and that less than 10% of our old wetlands remain, then you can begin to understand how much we have already lost.

That said, we are realistic enough to understand that in order to run a large dairy operation that actually protects our values, we will need to both adopt the best technology, knowledge and people for the task and also be open to accepting a more balanced set of 'bottom lines'. Being profitable is important, but is only really sustainable long term if we ensure that our environment is protected first. That's how our old people thought and that's how we must act. Our plan is to test our ability to farm "sustainably" across cultural, economic, environment and social bottom lines by first developing three pilot farms on our property at Eyrewell, North Canterbury. If we cannot make a success of the venture according to the high standards we set ourselves, then the tribe has signaled its intention to reject dairying as a long-term sustainable use of our environment.

There is no doubt in my mind that now is the time to show that dairying does not have to be conducted at the expense of our region's 'natural' capital. The dairy sector has significant expertise in this area and we should all focus this towards the desired outcome. We are blessed with world-class water and wildlife. This is at the heart of who we are as Ngāi Tahu, and I don't think we are too different in this feeling from many other South Islanders – especially those families who have passed their land on from generations to generations like we have. We believe that it's time to work together better to ensure the long term wealth and well-being of our land and water and our communities. The cornerstone of who we are is our environment and we simply won't compromise on it. That would undermine the efforts of our elders and take away some of the true joys

³ Ngāi Tahu are the collective of whānau (extended families) and hapū (sub-tribes) who hold mana whenua / mana moana (traditional tribal authority) over 80% of the South Island, extending south from Te Pari-nui-o-Whiti (Cloudy Bay) on the east coast and Kahurangi Point on the west coast.

of life for those who come after us. Sustainable resource use is integral to our culture. Using our lands and waterways to sustain the wellbeing of our whānau is something we have always done and will continue to do.

With so much at stake, I expect that there will be plenty of attention paid to our pilot dairy farms. Without any doubt, we will have to continue to challenge ourselves, monitor and call into question every step of the journey. That said, however, if we do it well, there is wealth and well-being to be gained for all of us.

Previously published with the assistance of *IrrigationNZ News*

4.6 Innovative River Solutions Centre at Massey

Researchers in the Institute of Natural Resources at Massey University from a range of environmental sciences including ecology, hydrology, geomorphology and soil science are joining forces and ideas to work together to provide novel solutions to current river catchment and freshwater problems. *Innovative River Solutions* will bring together the expertise in these disciplines and information from river user and interest groups.

The future of our rivers will be largely determined by how we manage their catchments and to do this effectively we need to understand all that influences them. Freshwater management in New Zealand needs connected, innovative and interdisciplinary scientists to provide relevant information to better manage the nation's rivers and freshwater resources. Modern river science involves highly specialized, rapidly developing and diverse fields and there is a need to provide an integrated and more holistic perspective in catchment and river science to sustainably manage these systems.

Massey University has invested in development of the Innovative River Solutions Centre in a project led by Senior Lecturer in Physical Geography, Dr Ian Fuller and Associate Professor Russell Death in Ecology. *Innovative River Solutions* will act as a hub of expertise and be informed by local knowledge and leading international science to provide practical solutions for the management of New Zealand's freshwater and river resources, as well as high quality results from research at the cutting edge of river and catchment science.

Innovative solutions for integrated catchment and river science require recognition of natural river dynamism in space and time, understanding rivers as responsive and sensitive landscape features, functioning as integrated catchments. This is best achieved by taking a holistic, integrated river science approach, which identifies causes rather than symptoms and treats reaches in a connected catchment context. In turn this requires development of catchment-scale integrated modelling tools to assess land and water management strategies, which, at least in part, can be derived from establishing field laboratories with shared and multiple use field experiments and monitoring sites across the range of environmental sciences in the Centre.

The project is beginning to connect with regional councils – initially in the lower North Island, government ministries and departments and other key river groups. We will work with river stakeholders to identify issues and develop a comprehensive information hub that will guide best practice in managing New Zealand's dynamic catchments and river systems.

For further information contact rivers@massey.ac.nz

4.7 The Naturalisation of an Artificial Drainage Channel – Any Ecological Benefits?

By Alex James

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With much of Christchurch being built on wetlands, numerous artificial drainage channels were excavated in the late 19th and early 20th centuries. Many of these are box drains lined with wood or concrete to prevent the collapse of their vertical banks. When these channels were built they were valued only for their drainage capacity, while today with the Christchurch City Council's (CCC) "six values" approach the waterways of the city are recognised for their ecological, landscape, recreational, heritage, cultural, and drainage values. In 2006, a 640 m section of the unimaginatively named No. 2 Drain received significant funding to be naturalised by replacing the box-lined drain with a more natural looking channel, a stony substratum, low vegetated banks, an improved road culvert for fish passage, and a large stormwater detention basin. EOS Ecology was involved in the design and build phases to ensure the ecological benefits of the naturalisation were maximised and specifically to ensure habitat for a population of the declining bluegill bully (*Gobiomorphus hubbsi*) was retained and enhanced. While such projects are often assumed to have ecological benefits, most are never adequately monitored to determine if this is the case. Fortunately, in this instance the CCC had the foresight to have a survey of habitat condition, aquatic invertebrates, and fish carried out prior to the naturalisation works. EOS Ecology designed and conducted this survey, which involved four sites (three within the naturalisation section and one control) being sampled once before (2006) and twice after (2008 and 2010-11) channel naturalisation works. Construction occurred mid-2007 to mid-2008. In 2010-11 the invertebrate survey occurred in December 2010 while the fish survey was done in March 2011 (after the February 22 earthquake).

No. 2 Drain is a very low gradient system draining a predominantly horticultural catchment on the northern fringe of urban Christchurch. As such it has a mostly soft-bottomed (sandy) substrate, low and homogeneous water velocities, and an invertebrate and fish community dominated by species that prefer or are tolerant of such conditions. The invertebrate community was dominated by snails (*Potamopyrgus antipodarum*), seed-shrimps (Ostracoda), and non-biting midge larvae (Orthocladiinae). The fish fauna was

dominated by shortfin eel (*Anguilla australis*) and three species of bully – common bully (*Gobiomorphus cotidianus*), upland bully (*G. breviceps*) and bluegill bully (*G. hubbsi*). Of the species encountered, the most notable was bluegill bully, which is more typically found in larger, swift, stony-bottomed rivers where they live among the rocks in swift riffle habitat. Bluegill bullies are rare in Christchurch and for the No. 2 Drain catchment this is the only area they are known to be. This species is listed as "declining" by New Zealand's latest freshwater fish conservation status report (Allibone *et al.*, 2010) and was found exclusively in the lower section of No. 2 Drain, which had a stony bed and moderate water velocities. EOS Ecology ensured special attention was paid to retaining the habitat preferences of this species during the design of the



naturalised channel to ensure bluegill bullies would persist in No. 2 Drain and to increase the potential habitat area suitable for this uncommon fish. During the naturalisation works the existing bluegill bully habitat was dewatered for over nine months. To avoid the loss of this locally unique fish population around 100 individuals were housed in captivity by EOS Ecology for the duration of construction and released into the “new and improved” habitat once flow resumed.

The naturalisation project increased instream habitat complexity and heterogeneity but did not result in any dramatic changes to the aquatic invertebrate or fish fauna within the 2.5 years since naturalisation. However, more subtle changes were notable, with several sensitive caddisfly (Trichoptera) taxa appearing less than six months after habitat improvement, albeit in low numbers (accounting for less than 1% of all invertebrates captured). It is difficult however to attribute this solely to the improved habitat as they also appeared at the upstream control site. Fish were abundant in the naturalised section within six months of flow resuming, indicating rapid colonisation. After 2.5 years the naturalised section supports a similar fish fauna as it did prior to naturalisation. Our post-naturalisation surveys have only encompassed 2.5 years of recolonisation and it is possible new invertebrate and fish species may colonise given enough time. For a number of species however, there are likely to be limitations to natural colonisation (eg, physical barriers such as tidal control structures, culverts, and urban areas, or the nearest source populations may be beyond the dispersal limits of some species). Similarly, it must be realised that stream naturalisation does not necessarily improve water quality.

Encouragingly, the bluegill bullies had persisted some 2.5 years after reintroduction and had colonised the new areas of habitat specifically designed to suit their substrate and flow preferences, although it was evident the 22 February earthquake had damaged some of this habitat. Another positive effect was a notable increase in the numbers of common bullies, most likely a result of the large substrate providing both habitat and spawning sites. Additionally, during the surveys, schools of inanga (*Galaxias maculatus*) were observed moving upstream, indicating this species is benefiting from fish passage improvements to the road culvert, with the creation of a resting spot below the culvert and addition of coarse substrate in culvert. Although not specifically measured as part of this study, it is evident the naturalisation has also made No. 2 Drain more appealing to a number of bird species including, pūkeko (*Porphyrio porphyrio*) and New Zealand scaup (*Aythya novaeseelandiae*). Overall this naturalisation project could be considered to have had major improvements to landscape values and minor improvements to ecological values all while maintaining the drainage values that were the original purpose of No. 2 Drain. Most importantly the bluegill bully population seems to be self-sustaining and capable of increasing their range along No. 2 Drain wherever habitat is suitable.

Earthquake footnote: The 22 February 2011 earthquake damaged the specially-designed bluegill bully section through lateral spreading of the banks, inputs of liquefaction smothering the coarse substrate, changes to water levels, and reduction in water velocity. This has effectively reduced the area of suitable bluegill bully habitat and we are hopeful this section will soon be recreated to suit the needs of this special native fish.



Drain, before naturalisation (2006)



Construction phase (2007)



“No 2. Drain” – before and after

Post naturalisation (2008)



Post naturalisation (2011)





5 Student News

By Kristy Hogsden

Outgoing student representative, NZFSS Executive

A few things you might be interested in:

1. Changes to student loans and allowances

Does this affect you? For more information, check out: <http://www.studylink.govt.nz/about-studylink/media-releases/2012/changes-to-student-loans-and-allowances-budget-2012.html>

2. NZFSS Best Student Paper Award

Are you writing a fantastic paper from your postgrad research? Or have you recently had a paper published?

Information on the recently instated Best Student Paper Award can be found at:

<http://freshwater.science.org.nz/index.php/awards/best-student-paper-award/>

3. Getting involved

Are you looking for ways to get more out of your postgrad experience? Would you like to share your research with community or with school students? Giving community lectures or volunteering with outreach programs through your university are great ways to promote your research, get more experience giving presentations, and perhaps engage future generations of scientists. Or are you interested in taking a more active part in NZFSS? Do you have skills that you could contribute to the society or ideas about how we should communicate freshwater science in the country? Get in touch with your student representative to share your ideas. As of the end of 2012 I'm handing on the mantle. Your new rep is **Helen Warburton** – give her a bell, she'd love to hear from you.



6 Critter of the year 2012

Triplectides

Stephen Moore, Landcare Research

The “stick caddis” *Triplectides* is our most common leptocerid caddisfly. As in other leptocerids the hind legs are much longer than the forelegs, but the adult *Triplectides* is distinguished by the dark bands between the leg joints. The larvae of our *Triplectides* species are very similar in appearance to leptocerid larvae we've found in other parts of the Asia-Pacific region.

They are often found in streams with abundant leaf litter, partly because they are shredders, feeding on decomposing leaf litter, but also because they use leaf litter and fine woody debris as building material for their protective cases. *Triplectides* is an ingenious case-builder, able to use all sorts of streambed material in all sorts of configurations to create its mobile home. While the most common case-building materials are small sticks and leaf fragments, *Triplectides* will also use the cases of other caddis genera, and they sometimes decorate their cases with snail shells and various hard body parts from other invertebrate groups.

We thought their case building creativity alone made *Triplectides* a worthy critter of the year – check out the photos below!



A common but ever beautiful case made with leaf litter

An tricky case opening half way along a wood fragment

The stylish blackberry fragment case

The 'shared living' stick fragment case

The 'shared living' stick fragment case, alternative design

The ultimate in sustainability – the 'reuse of an old *Olinga* caddis case' case



And the stunning modern art pieces – 'case with ostracod valves' (top) and 'case utilising harvestman carapace' (bottom)



7 Conference 2013

2013 ANNUAL NZFSS CONFERENCE WITH NZ MARINE SCIENCES AND AUSTRALIAN SOCIETY FOR FISH BIOLOGY.

Much of our work is carried out within fixed boundaries defined by ecosystem type, species, geography or discipline. Frequently, important advances in knowledge are made through the cross-fertilisation of ideas at the interface of these boundaries, whether they be across disciplines, biotic groups or ecosystems, or through the interaction of science with social, cultural and economic perspectives. This conference will stimulate thinking 'outside the square' by linking pure and applied aquatic sciences at the interface of land-water, riverine-estuarine and coastal-marine realms, between food webs, biotic groups and ecosystem processes, and across multidisciplinary groups integrating environmental science, social science, economics and traditional knowledge. Join the New Zealand Freshwater Sciences Society, New Zealand Marine Sciences Society and the Australian Society for Fish Biology in Hamilton, New Zealand, over 19-23 August 2013, and explore 'aquatic science at the interface'.



8 Research News

8.1 Universities

8.1.1 University of Otago

Many of the University of Otago team spent a good deal of time this year consumed with planning for this year's conference, which went well and stimulated some spirited discussion. Apart from conference planning there has been plenty of aquatic activity at the University of Otago. **Gerry Closs**, **Abbas Akbaripasand**, **Michael Greer** and **Lan Pham** travelled to Portugal for the Ecology and Conservation of Freshwater Fish conference in May/June. They can all happily report that the conference was extremely interesting, and the scenery, wine and food were superb. With temperatures up to the high 30s, the conference also provided a very enjoyable break from the Dunedin winter. **Christoph Matthaei** and **Katha Lange** also managed to experience some real Northern hemisphere summer heat by attending the Society for Freshwater Science (formerly NABS) meeting in Louisville, Kentucky, in late May. It was a stimulating conference, and while the city was perhaps less so its inhabitants were friendly and an impressive river runs through it. Christoph then went on to present findings of recent multiple stressors research done by the Otago Stream Team to audiences at two research institutes in Germany. A winter escape wasn't on the cards for **Sourav Paul**, who travelled to Hobart for the combined Australian and NZ Marine Sciences Conference to present his work on the bioenergetics of estuarine mysids.

Gerry Closs and **Charlyne Ribeyrolles** have been investigating whether avoidance of hypoxia is a possible reason for terrestrial spawning in inanga. In short, it isn't – the eggs of inanga can survive severe hypoxia for hours on end with no adverse effects. Gerry is also co-editing a book with **Marty Krkosek** and **Julian Olden** on the 'Conservation of Freshwater Fish', to be published by Cambridge University Press. **Christoph Matthaei** has started a new multiple stressors research project investigating the off-farm effects of the nitrification inhibitor DCD on running water ecosystems. This project involves PhD student **Romana Salis**, Honours student **Katie Blakemore** and collaborations with **Tina Summerfield** in the Botany Department at Otago, an environmental chemist at Mississippi State University and two ecological geneticists at the University of Bochum, Germany. In their role as graduate student supervisors, last August both Gerry and Christoph were surprised and honoured to receive "Top 14 Supervisors 2011" awards from the Otago University Students' Association, and Christoph also received the "Supervisor of the Year Award (Division of Sciences)". **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.

Carolyn Burns is co-supervising the PhD research projects of three students and furthering her work with **Prof Mike Brett** (University of Washington, Seattle, USA) on the use of fatty acid ratios as tracers of trophic interactions in aquatic food webs. In collaboration with **Ian Duggan** and colleagues (University of Waikato) she is working on invasive *Daphnia* in New Zealand. In addition, Carolyn, **Marc Schallenberg** and **Piet Verburg** (NIWA) are finalising a review of the potential use of biomanipulation in New Zealand to improve water quality and is preparing a key based on morphology (supported by genetics) of native and exotic *Daphnia* and their current distribution in New Zealand.

Marc Schallenberg continues to co-supervise three PhD students: **Tina Bayer**, who is working on climate change impacts on the productivity of Lakes Wanaka and Wakatipu; **Amy Weaver**, who is working on land use impacts on carbon nitrogen and phosphorus loading and microbial dynamics in deep glacial lakes; and **Vanessa Hammond**, who is working on growth-limitation of didymo in South Island rivers. Marc's MSc student,

Sarai Cosgrove, recently completed her MSc thesis titled, "Anthropogenic impacts on Waituna Lagoon: Reconstructing the environmental history".



Dave Kelly (left) identifying macrophytes on lake George, Southland (March 2012) and Marc Schallenberg with a sediment core from Lake Johnson, Central Otago (Feb. 2012)

As well as the *Daphnia* work with Carolyn, Marc is writing a paper on the impacts of trout on NZ zooplankton, working with Piet Verburg on model to predict oxygen depletion and internal nutrient loading in lakes and recently completed a study investigating the pre-human and pre-European ecological integrity of New Zealand lakes. Marc continues his collaborative lakes research with **Dave Kelly** (formerly of DoC, now Cawthron) and researchers at the University of Waikato

In addition, he continues as an associate editor of the NZJMFR, has been keeping up his palaeo-limnological collaboration with **James Goff** (University of New South Whales), writing evidence for the Mōkihinui River Environment Court hearings, and trying to get a somewhat worrying backlog of data written up for publication.

The PhD students have been very active. **Abbas Akbaripasand's** PhD on the energetics of banded kokopu has been submitted and received favourable reviews from the examiners. Congratulations! **Jeff Vanderpham** has also recently submitted his thesis on the morphology of the mechanosensory system in common and redbfin bullies. **Vanessa Hammond** continues to work away on her PhD thesis on didymo – her work further confirms the link between hydrological stability, regulated rivers and didymo blooms. **Rasmus Gabrielsson** is working through the results of Chinook salmon and trout recruitment and migration data – a particularly interesting result being strong evidence for the downstream migration of salmon smolts from Lake Hawea through the Dunstan and Roxburgh dams supporting the Clutha river salmon run. **Doug Jones** is currently writing up the results of his experiment on brown trout migration and food supply, completed in Sweden in collaboration with **Larry Greenberg** (Karlestad University). **Aurelien Vivanços** is currently working with **Cédric Tentelier** and **Agnes Bardonnet** (UMR Ecobiop) in France on an experiment examining the effects of changing density on the stability of social hierarchies in juvenile brown trout. **Manna Warburton's** work on torrentfish progresses steadily; samples for a detailed study of population structure using genetics and otolith microchemistry have been collected, and the analysis is about to start. **Javad Ramezani** has completed an epic reach-scale experiment examining the effects of silt addition or removal from

farmland streams on trout and other fish – the results suggest that trout and particularly eels like streams without lots of deposited fine sediment. He's also started writing up his PhD, with a first manuscript due to be submitted soon. **Lance Dorsey** has been working on brook charr in the Otago uplands – results suggest the populations of this introduced fish are probably in a pattern of long-term decline. Work is in progress on their bioenergetics and possible impacts on galaxiids. **Peter Jones** has completed one season of sampling eggs and larvae of non-diadromous galaxiids, with results indicating clear differences in the early life histories of these fish. **Michael Greer's** results on the management of agricultural drains suggest that partial macrophyte

clearance may actually benefit giant kokopu, although total clearing is severely detrimental. **Sourav Paul's** work on the bioenergetics of estuarine mysids suggests that osmoregulation is extremely difficult at low temperatures, and this may explain the significant decline in the abundance of estuarine mysids in winter. **Tanya Dann** has just commenced a PhD on the life histories of damselflies in the South Island, examining the relationship between altitude, life history and the distribution of *Austrolestes* and *Xanthocnemis*.

Francis Magbanua completed his PhD on the combined impacts of the pesticide glyphosate and deposited fine sediment on stream communities in early 2012 and is now working as a Senior Lecturer at the University of the Philippines. In short, Francis's PhD research shows that, at least when used at the concentrations within the environmental exposure limit in NZ, glyphosate has less serious effects on ecological stream health (assessed by studying benthic invertebrates, algae and organic matter decomposition) than fine sediment. **Jeremy 'Jay' Piggott** has been working furiously this past year writing up his PhD work investigating the interactive effects of multiple stressors related to land use and climate change on stream communities. He intends to submit his thesis soon, and a first publication based on his PhD work is currently in revision. In July 2012, Jay started a research fellowship with the Association of Pacific Rim Universities (based at the National University of Singapore) where he is working to leverage multi-lateral research from the top 42 research universities across the Asia-Pacific into the regional public policy space around sustainability and climate change.

In 2011/12, **Katha Lange** won a six month long IGB Fellowship in Freshwater Science at the Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB) in Berlin, Germany. During this period she deferred from her PhD to work on ecological models predicting the distribution of benthic invertebrates in lowland river meanders, presenting the findings at the 2012 Society for Freshwater Science meeting in Kentucky, funded by a travel grant from the IGB. Katha is currently conducting a one-year survey of multiple stream sites in the Manuherikia River catchment to disentangle responses of benthic organisms among the gradients of nutrient enrichment, fine sediment inputs and increased water temperatures due to water abstraction for irrigation. She also prepared a report from a collaborative study with Fish & Game Otago investigating land use effects on brown trout in the Manuherikia catchment.

Antje Bierschenk finished her lab work last year and started writing her PhD thesis. Her first journal article, a study of the impacts of catchment land use on ecosystem functioning along a freshwater-marine continuum, was published this year.

Chemistry PhD student **Pourya Shahpoury** is close to submitting his thesis on various pesticides and other contaminants in aquatic ecosystems. Pourya's thesis focuses on ecological questions and sophisticated



Katha Lange sampling a farmland stream affected by high levels of deposited fine sediment in the Manuherikia River catchment in Central Otago.

methods for detecting these contaminants. He found that while bed sediments in streams draining organic sheep/beef farms across the South Island contained lower concentrations of current-use pesticides than their conventionally farmed counterparts, the sediment in both stream types still showed detectable, and similar, concentrations of the residues of pesticides such as DDT that were banned in NZ almost 40 years before Pourya conducted his study.

The Masters students have also been slogging away. **James Shelley** gained a distinction for his MSc on the effects of water abstraction on stream communities in central Otago. The Otago winter chill obviously scared him away as he's now working on fish in the tropical Kimberly region of Western Australia – well done James! **Lan Pham** has completed working through invertebrate samples collected from the Zeelandia - Karori Sanctuary following the eradication of trout using rotenone – an initial look over the data suggests relatively rapid recovery of the invertebrate communities following the rotenone treatment. **Rowan Moore** has completed his first sampling effort examining relationships between food abundance and redfin bully microdistribution. **Josh Tabak** is examining the impact of culverts on the distribution of fish in Otago coastal streams, and **Jon MacCallum** is designing a study aimed at examining the spatial ecology of didymo in large rivers.

Finally, **Greg Stanley** (BSc Hons) completed his research into the ability of the riparian plants *Phormium tenax* and *Carex secta* to filter excess nutrients from four levels of dairy farm leachate in June 2011. He found that plants showed a positive growth response to all four leachate concentrations, removing up to 41% of total nitrogen and 35% total phosphorus in the leachate at the highest concentration. The project is currently being written up for publication, and Greg is now working full time in an ecological restoration team in Christchurch.

8.1.2 University of Canterbury

Angus McIntosh and **Jon Harding** continue to lead the Freshwater Ecology Research Group (FERG) at the University of Canterbury. Angus heads the research programmes on enhancing the effectiveness of riparian management funded by the Mackenzie Foundation and the Marsden-funded research on the spatial compression of food webs. Both of these projects are drawing to a close with lots of work on final experiments and many publications and other outputs in the pipeline. Although the earthquake recovery process continues to throw up challenges, there have been some great new developments on campus, and it has been full steam ahead with many students completing and others starting.

Simon Howard has almost completed field work on his investigations of flow relationships in bignose and upland longjaw galaxias. Despite battling some difficult weather conditions and very difficult to find fish,

he has uncovered important flow-related distribution patterns in both these threatened fish species.

Over the last summer, **Kim Roberts** was busy trialling methods to remove stream sediment but is now writing up her MSc thesis describing the limitations of the recovery of invertebrates in restored streams from observational and experimental data.

As a follow-up to their survey of Northland lakes in search of the newly established dragonfly *Tramea loewii* **Mike Winterbourn** and **Steve Pohe** have been investigating the life histories of four dragonfly species in Lake Heather on the Aupouri Peninsula lakes. A one-year sampling programme is



The dragonfly *Diplacodes bipunctata* sunning itself alongside Lake Heather in Northland

now complete and the study is being written up. Mike is also involved with members of EOS-Ecology in the production of a guide to aquatic invertebrates of sub-Antarctic Campbell Island.

Jon O'Brien, Milen Marinov and Elizabeth Graham have been conducting a project to see if organic matter additions can be used to increase denitrification rates in streams. The project, now in its second year, involves adding hundreds of leaf packs to agriculturally impacted streams to simulate inputs from riparian vegetation.

Steve also continues his work with **Jon Harding** on the functional feeding of NZ stream invertebrates as well as a study of habitat utilisation of the fringe-gilled mayfly (*Isothraulus abditus*) in collaboration with Aran Arrieta and Olly Ball from NorthTec.

Kristy Hogsden welcomed her daughter, Pippa Elizabeth, who was born in August. Kristy has been busy at home for most of the year but recently returned to the university to finish writing up her PhD on the influence of acid mine drainage on stream food webs.

Hamish Greig returned to Canterbury after a stint at the University of British Columbia in Canada. He is busy continuing postdoctoral work on understanding the influence of climate change on freshwater ecosystems. Hamish has also been leading an international working group collaboration on how changes in temperature alter species interactions.

Danladi Umar has been busy with his PhD research on how land use changes affect stream communities in highland tropical streams in Nigeria, which is based on the Mambilla plateau, north eastern Nigeria. Danladi has surveyed the physico-chemical parameters and benthic invertebrates of 55 replicate streams across 9 contrasting land uses. He is also conducting more intensive sampling in 9 streams in pasture and forest to measure leaf pack decomposition and generate food webs from gut and isotope data.

Karen Renouf has completed her experimental field work involving use of in-situ, ion-exchange resin bags to compare seasonal nutrient budgets of native-planted versus grass 'set-aside' riparian buffers on agricultural land. She is currently busy with analysis and interpretation of the resulting information before moving on to the third and final part of her Masters research on agricultural riparia.

Frank Burdon is currently writing up his PhD thesis describing results from observational and experimental data documenting the impacts that fine sediment pollution has on invertebrate communities in agricultural streams. With support from the SIL Trust and the Canterbury Branch of the Royal Society he presented at the annual meeting of the Society for Freshwater Science in Kentucky on the non-linear effects of sediment deposition on coarse organic matter processing and associated detritivorous insects. This work complements his findings of a threshold response to fine sediment by pollution-sensitive benthic taxa in lowland streams.

Amanda Klemmer is a few months into her PhD at Canterbury (with **Angus McIntosh**) studying the effects of subsidies on trophic cascades in meta-ecosystems that span the aquatic-terrestrial boundary.

Mark L. Galatowitsch has been studying the life-history trade-offs of several generalist invertebrates across predator-permanence gradients in Canterbury high country lakes and tarns. To determine whether these animals have flexible life-histories Mark has been monitoring population dynamics and growth rates. In



Karen busy deploying her ion-exchange bags for their long stay in the ground. Unfortunately they also tend to attract the attention of curious bovines!

addition, he has conducted a series of mesocosm experiments to measure variable generalist responses to different predators.

Helen Warburton has been running predator-prey interaction strength experiments in mesocosms at the Cass Field Station to investigate patterns between body size and other trait characteristics such as armouring and mobility. She has also sampled eight streams in summer and autumn to gather data to create connectance based food webs.

8.1.3 Victoria University of Wellington

What happens when lakes blow up?

Margaret Harper and **Alexa Van Eaton** have found that diatoms which grew in paleolake Taupo before the Oruanui supereruption of 27 thousand years ago were scattered with tephra (volcanic ash) as far as the coast near Napier 80 kilometres away. Margaret has also contributed work on diatoms to the final volume of the New Zealand Inventory of Biodiversity and studied floras in samples from the Denniston Bioblitz and Vanuatu.

8.1.4 University of Waikato

David Hamilton recently worked with **Deniz Özkundakci** and **Chris McBride** (University of Waikato), **Marc Schallenberg** (University of Otago), **Piet Verburg**, **Mary de Winton** (NIWA) and **Dave Kelly** (Cawthron) to put together a chapter on “Climate change in New Zealand lakes” for an upcoming book on “Effects of Climate Change and Variability on Inland Water Systems of the World”. Unlike many overseas lakes and those in the Northern Hemisphere in particular, there are not consistent warming trends for lakes examined in NZ. However, the El Niño event of 1998 was particularly significant, with incomplete winter mixing of Lakes Taupō and Pupuke which resulted in an extended period of oxygen depletion.

Bex Eivers is currently into the third year of her PhD studying constructed wetlands and sediment settling ponds on inflows to shallow Waikato peat lakes. She is evaluating how effectively different end-of-drain treatment systems reduce nutrient and sediment concentrations in runoff from dairy farmed catchments to downstream lakes. Bex is also investigating whether constructed wetlands provide habitat for aquatic communities, including zooplankton, macroinvertebrates and fish.

Ian Duggan continues to work on invertebrate invasions and zooplankton. His survey work with **Kevin Eastwood** of polyps of the freshwater jellyfish showed this species to be far more common and widespread than observations of the jellyfish stage suggest.

Kevin Collier has been continuing work on the Waikato River in association with PhD student **Michael Pingram** and post-doc **Konrad Gorski**. As well, he is supervising **Tammy Valler**'s MSc thesis on metal burdens and ecotoxicity of urban stream sediments in association with Sue Clearwater of NIWA. This summer the large rivers group was joined by students investigating movements of grey mullet (**Corine de Gruijter** from the Netherlands) and habitat use by inanga using otolith microchemistry (**Ashley Webby**), pest fish recruitment from inundated floodplains (**Nicholas Wu**), and macroinvertebrate communities of floodplain habitats (**Sarah Cross**).

Konrad Gorski has been developing a 3-dimensional hydrological model for a floodplain area on the lower Waikato to provide the physical template for modelling fish habitat availability and water quality responses to inundation. We have recently been joined by French intern **Mathieu Ronze** who will be working with Konrad to develop an historical morphological template of the lower Waikato River based on transect data collected before construction of the flood control scheme. Konrad is also collaborating with scientists in Chile to compare inanga habitat use between river systems in the two countries.

Michael Pingram is nearing completion of his PhD study investigating aquatic food webs and energy flow in the lower Waikato River. He is currently analysing physical and food web patterns in different hydrogeomorphic zones and lateral habitats.

Jennifer Blair is preparing to hand in her PhD thesis on the factors influencing common smelt and rainbow trout production in the Rotorua Lakes. Rainbow trout growth rates in these lakes were dependent on the amount of habitat with favourable temperature and DO concentrations. In the shallower, eutrophic lakes, periodic stratification events had the potential to severely limit trout habitat because of diminished DO in the bottom waters. Also, bioenergetics modelling showed that the season when rainbow trout were released into lakes from the hatchery influenced future growth. Monitoring of smelt populations has shown that healthy, self-sustaining smelt populations exist in Lake Rotoiti, but that smelt are food-limited over winter, which means that rainbow trout must increase consumption rates of smelt to adequately meet their energetic needs.

8.1.5 Massey University

Mike Joy has been travelling the country giving talks to many varied groups following on with the 'clean green delusion' theme. He continued with the campaign trying to stop the commercial harvest of longfin eels and this has made the news lately with the discovery that our threatened eels end up in pet food in the USA. He has been in New Caledonia working with the Southern Province government through ERBIO (Bureau d'Etudes et de Recherches biologiques) on developing a New Caledonia fish index of biotic integrity. He and Bruno David are finishing off the MfE envirolink tools project "New Zealand Freshwater Fish Monitoring Protocols: Part 1- Wadeable Rivers and Streams".

Ian Henderson and **Paul Barrett** have been working on Lake Namunamu. This is a lake near Hunterville that is holomictic, only mildly eutrophic and with no unusual sources of sulphur, yet regularly develops a dense bloom of green sulphur bacteria during summer. They are looking into the anoxygenic photosynthetic bacteria in the lake and a possible link to landuse changes. Paul Barrett has designing sampling equipment to suck water from narrow depth ranges in the lake.

Russell Death is continuing work on Bayesian Belief Network (BBN) models for the management of multistressors in the Manawatū River. The models developed so far have had similar predictive ability to other AI modelling techniques, but without the advantages of the real time visual display of a BBN. He is also writing up the material on longitudinal patterns in Chilean stream invertebrate communities, if he can just figure out why the Rio Cisnes has a gradient and the Rio Asyen does not.

Sryian Jayasuriya has started his PhD research on beta diversity patterns in fish communities. He has started sampling in Taranaki and is currently analysing the collected data to establish whether environmental variables, environmental distance or geographical distance is a better predictor of community patterns.

Josh Markham has been completing the write up of his MSc thesis on the effects of river engineering on ecological integrity of Wairarapa Rivers. After a stint with Fish and Game in Temuka, he recently returned to the Manawatū to work for Horizons Regional Council.

Corina Jordan took a 6 month break from her PhD while she coordinated the Fish and Game appeal on the One Plan to the Environment Court. However, with the case completed she is back into her research on the geomorphological linkages to trout population dynamics along with all the other demands of a Fish and Game environmental officer.

8.2 Government Organisations and Crown Research Institutes

8.2.1 Department of Conservation

General

The Department of Conservation (DoC) has recently been through an organisational review of its science and technical staff. Previously the national freshwater team included three Scientists and two Senior Technical Support Officers (STSOs) reporting to a **Eduardo Villouta**, Freshwater Manager, and ten Conservancy-based Technical Support Officers (TSOs) who reported locally. The review has essentially centralised the reporting lines for science and technical staff, producing one national Freshwater Team to support Conservancy and Area staff to undertake freshwater conservation.

As a result of the review, we have had to farewell three TSOs – **Murray Neilson** (Otago), **Darrin Sutherland** (West Coast) and **Rebecca Lauder** (Bay of Plenty). Their knowledge, skills and experience will be greatly missed. Another TSO, **Amy Macdonald** (Northland) has taken a position in National Office, Wellington, supporting the Freshwater and Marine Teams. **Eduardo Villouta** moves onto a position as Terrestrial Ecosystems and Species Manager.

Recently we have also had to farewell **Dave Kelly**, Freshwater Scientist, who seized the opportunity to escape Christchurch and take up a research position at Cawthron. Likewise, Dave will be sorely missed.

The new Freshwater Team includes three Scientists and eight Technical Advisors, focused mainly in Hamilton, Wellington and Christchurch with some distributed positions in Whangarei, Nelson and Invercargill who report to a Wellington based Manager.

Rosemary Miller is now managing the Freshwater Team in Wellington. **Dave West** and **Hugh Robertson** hold onto Freshwater Scientist positions, based in Christchurch.

The team of Technical Advisors is made up of **Natasha Grainger** and **Jane Goodman** (in Hamilton), **Martin Rutledge** (in Nelson), **Philippe Gerbeaux**, **Sjaan Bowie**, **Anna Paltridge** (in Christchurch) and **Emily Funnell** (in Invercargill).

Auckland Area

Callum Bourke has been involved in many diverse freshwater projects this year and seeing some tangible conservation gains. Of note was the first stage of the redfin bully and kōura translocation on Motutapu Island where 100 of each species were released in the Home Bay Stream. Black mudfish surveying and associated wetland protection at these sites has been promising and Callum is working with Auckland Council scientists on a possible giant kokopu translocation. Motutapu Island has been a key focus with the two largest streams and several wetlands on the island now fenced off. Grass carp still take up a fair amount of Callum's time. Callum found Whitebait compliance work on the Waikato River interesting, but was sad to see the degraded state of the lower Waikato.

Waikato Conservancy

Jane Goodman continued to work on several large Resource Consent applications with **Michelle Lewis** (RMA planner) and Area Office Staff. Major consent applications included the re-consenting of the Huntly Power Station, several Wastewater Treatment Plant consents, roading consents and 3 global consents for Flood Management in the Waikato. Jane has also been inputting to the Freshwater Inventory and Monitoring Toolbox and working on Threatened Species Management Planning.

Jane also supported Waikato Area Office Staff (**John Gumbley**, **Justin Wyatt** and **Amy McDonald**) with their pest fish eradication plan for Serpentine Lakes, aquatic transfer applications for grass carp, mudfish surveys as well as a diverse range of other freshwater projects.

The Whangamarino team had **Lucy Roberts** filling in as Programme Manager while **Shannon Patterson** was on maternity leave. Lucy and Shannon along with **Kevin Hutchinson, Matthew Brady, Norman Hill** and **Chris Annandale** have continued their great work gaining an understanding of and restoring Whangamarino Wetland.

Hamilton Conservancy – Research and Development

Natasha Grainger recently returned from maternity leave and has jumped straight back into freshwater work. Natasha is currently reviewing freshwater sampling protocols for the Inventory and Monitoring Toolbox, tidying up procedures relating to transfer and release of live aquatic life as well as adjusting to the new structure.

Taupō-nui-a-Tia Area Office

Reinstating the early spawning run of rainbow trout in Taupō

The early part of the run of rainbow trout in the Taupo fishery has been on the decline for the last 10 years.

Michel Dedual has been exploring the feasibility of reinstating this part of the run. The overarching condition to embark on such an operation is to make sure that the genetic make-up of the Taupo trout is not affected by the introduction of “foreign” fish. A substantial part of this exploration involved genetic work that was carried out by **Dr Elizabeth Heeg** who is a molecular biologist from Victoria University.

FAO Technical Guidelines for Responsible Recreational Fisheries

Michel has been invited by the FAO (United Nations) to be part of the experts panel that met in Berlin last year to contribute to the development of this document.

Smelt and trout abundance in Lake Taupo

In collaboration with NIWA Wellington (**Dr Richard O’Driscoll** and **Adam Dunford**) Michel has been developing a protocol to analyze echo-sounding data collected twice a year in Lake Taupo.

Moving in & re-arranging the furniture at the Freshwater Aquarium

Learning curves on displaying our native freshwater species are being undertaken by ranger **Randal Hart** at the Genesis Energy Freshwater Aquarium in the Tongariro National Trout Centre. One of the biggest challenges has been meeting the public perception of what a freshwater aquarium should look like. It is rather difficult to display nocturnal, secretive and shy fish that love to hide! Also native fish are dull and small compared to brightly coloured and showy tropical fish. Randal and his team have come up with two solutions – moving more fish into the neighbourhood, and re-arranging the furniture. About 50 more fish have been added to the central tank. Pieces of wood have been added that the fish like to shelter under, as opposed to disappearing down between the rocks. Kōura have had “apartments” built. These are constructed from pipes set side by side, keeping them happily ‘out of sight, out of mind’ to their neighbours but still visible to the public. The eels and kōura are proving the most popular.



Kōura in apartment building

Another operation challenge for the year-old freshwater aquarium has been to establish “norms” for each tank – for example, temperature, water flow, and light levels. There is an ongoing journey of how and

what to feed the fish, and the frequency of feeds. Experts had never seen such large, fat mudfish before! Condensation on the acrylic panels during humid days poses another challenge. Randal is quickly becoming an expert and was invited to present a paper on his learnings at the New Zealand Zoo and Aquarium conference held in Auckland during June.

Big picture learning gets bigger - *Taupō for Tomorrow* sustainability education programme

Big picture learning has been the task at hand for education based at the Tongariro National Trout Centre, which now includes a growing variety of onsite student experiences – the Taupō trout fishery, native fish aquarium, whio, and associations with local hydro-electricity and white water rafting. Teacher **Mike Nicholson** has made a 20 minute film with local film producer **John Ball** that connects all the topics under the theme of the care for our freshwater. The film connects with its audience through a young narrator Olly and analogies to the All Blacks.

A holistic update has also been applied to the Wonderful Wai year 5 & 6 programme that looks at sustainability of the Taupō catchment, with a focus on storm water. Students are encouraged to view our freshwater resources as an essential service and recognise that if they look after the resource now it will look after them into the future.

Nelson Conservancy

Martin Rutledge has been re-monitoring the Tarndale bully populations (which are looking good), assisting the Brook Waimarama Sanctuary group with their native fish habitat and aquarium projects, and helping Nelson City Council and WaiMaori with the MFE-funded Stokes Stream inanga habitat protection project. Besides considering potential freshwater impacts of local mining proposals Martin has been working with Marlborough District Council and Tasman District Council planners and ecologists to identify and protect freshwater values under their plan provisions.

Christchurch – Research and Development

David West has had a diverse year with activities ranging from working with Sjaan & Nicholas et al to help irrigators assess how good their screens are, to working with economists, demographers, environmental economists at a Multi-scale Integrated modelling of Ecosystems (MIMES) workshop. He has helped people use Freshwater Ecosystems of NZ (FENZ) and aims to improve DoC's use of spatial tools, including FENZ. With **David Moss'** help, he has completed intensive post-operation monitoring of the rotenone treatment at Zealandia and is writing up what looks like a dramatic improvement in native aquatic communities. Pest fish



Mike Nicholson interpreting the freshwater aquarium

work has been sporadic but rewarding, while native fish work has been sadly lacking, apart from the Zealandia sampling. The increase in effort by central government and research providers to seek DoC's technical input has been very pleasing but demanding.

A large focus of **Philippe Gerbeaux's** work has been on providing expert advice on RMA planning cases (West Coast Land and Riverbed Management Plans, Whanganui-Manawatū One Plan) and managing science contracts related to didymo research. Some significant time was also spent assisting with revisions of the Aquatic Transfers SOP. In his spare time Philippe has continued teaming up with scientists from the Paris Natural History Museum to document freshwater biodiversity in streams of the Pacific Islands.

Hugh Robertson continues to expand the integrated model of science-monitoring-freshwater management and restoration associated with the Arawai Kakariki wetland restoration programme. Science outputs are beginning to accumulate with the completion of two MSc projects, publication of papers (on Australasian bittern, palaeoecology, *Ruppia*) and via regional councils (the flood scheme in Waikato and Waituna Lagoon in Southland). New research projects with NIWA, Landcare Research, University of Canterbury and University of Otago examining nutrient limits are also underway. Hugh is also working with **Karen Denyer** on developing a strategic approach to the nomination of Ramsar sites in New Zealand. A highlight of the year was the National Wetland Symposium held in Invercargill, where the weather gods played their part during the field day at Waituna Lagoon.

Mahaanui Area, Christchurch

Helen McCaughan has been spending her time working with pest fish and various natives including glass eels and Canterbury mudfish. She's been involved with riparian planting at a few sites and helping a couple of groups set up their own native fish monitoring.

DoC and the Christchurch City Council are working together on the rudd population at Travis Wetland, with catch rates down by more than 95% since the 2007/8 season (381 rudd were caught in 2007/8, and only two in 2011/12 with the same effort). We've also been collecting otoliths and GSI data from Travis and another local site, but this data is not yet fully processed (anyone who's done otolith work will appreciate how long it takes to process 260 otolith pairs!).

Canterbury Conservancy

Nicholas Dunn has been undertaking the Freshwater Technical Support role in Canterbury Conservancy in the last year while **Sjaan Bowie** has been on parental leave. Sjaan returned to her role (part-time) in mid-February and Nicholas has continued in the role until July so the team made the most of the extra capacity to keep up with Canterbury Water Management Strategy (CWMS) initiatives, writing up giant kokopu monitoring undertaken, updating Canterbury information and finalising a Canterbury mudfish workbook and toolbox prior to the start of the new DoC structure. Nicholas and Sjaan (with assistance from **Dave West**) worked on the multi-agency fish screening working party (Irrigation NZ, Environment Canterbury, Fish and Game, DoC) to test water intakes to determine if fish are getting through them.

Fish survey and monitoring is continuing to be undertaken by Area Staff in Canterbury for lowland longjaw galaxias, bignose galaxias, upland longjaw galaxias, glass eels and Canterbury mudfish. This covers natural key sites, locations where we have undertaken management (eg putting in barriers), and translocation sites. New monitoring sites have been set for upland longjaw galaxias in the Rangitata.

Leanne O'Brien (from Ichthyo-niche) was contracted to conduct Canterbury mudfish larval (fry) surveys. Of significance she found previously unknown populations in the stockwater and drainage networks near Lake Ellesmere.

The successful installation of a barrier and removal of trout from the headwaters of the Fraser Stream Spring in Twizel has seen the continual recovery of lowland longjaw galaxias and bignose galaxias.

Sjaan Bowie, Pete Ravenscroft (Coastal Otago) and **Dean Nelson** (Twizel Area) finalised the joint Otago and Canterbury Conservancy Lowland Longjaw Management Plan which identifies the key locations, threats and management actions required to see the recovery of this nationally critical fish.

Scott Bowie (Tenure Review) continues to undertake freshwater surveys and promotes protection of values on pastoral leases through Canterbury and Marlborough.

John Benn (Canterbury Conservancy) has continued to make progress on catchment bibliographies for each major catchment in Canterbury and been the key DoC contact and coordinator for Environment Canterbury's CWMS initiatives. Through Environment Canterbury, DoC have had a number of opportunities to progress management actions at key biodiversity sites, for example, Mahaanui Area staff (primarily **Anita Spencer** and **Helen McCaughan**) have been scoping installing a barrier at a key mudfish location.

Anna Paltridge (Canterbury Conservancy) has continued to be the national DoC contact and coordinator for didymo operations.

The Ō Tū Wharekai Wetland Restoration Project (one of the key wetlands in the Arawai Kakariki Programme) encompasses the Ashburton lakes complex and upper Rangitata River in the high country of mid Canterbury. **Rosemary Clucas** and **Wendy Sullivan** (Raukapuka Area) and other staff continue to make great progress on this large programme. Key conservation outcomes to date include undertaking extensive inventories and monitoring; working in partnership with iwi in developing restoration goals and prioritising work; undertaking extensive weed control programmes of willow, broom and lupin; establishing recreation facilities that reduce visitor impacts on the wetlands while increasing satisfaction and awareness of the wetlands; increased partnerships with stakeholders and community groups; and developing greater education opportunities. O Tū Wharekai's 2007-2010 report has recently been finalised and is available via the DoC website.

Coastal Otago Area Office

Pete Ravenscroft has been monitoring and providing evidence for Seamgol galaxias in the Nevis River. He completed a catchment survey of the Kye Burn in an attempt to assess distributional shrinkage of the Central Otago roundhead galaxias within the catchment. Pete is currently producing a Management Plan for the catchment and has met with local landowners as they start to implement the plan. He has also been involved in inanga enhancement work on the Lower Clutha River – several kilometres of spawning habitat have been fenced and glyceria control has been started. Pete successfully removed trout from a 2 km section of Akatore Creek and is now seeking a resource consent to enhance the natural waterfall to prevent re-invasion.

Southland Conservancy

Emily Funnell returned from parental leave late last year and has been busy in the freshwater world on a part time basis. Most of her time has been spent working on the Awarua/Waituna wetlands as part of the Arawai Kakariki Project and the emergency response being lead by Environment Southland. A highlight has been seeing the aquatic plant *Ruppia* do well in the lagoon this growing season after the previous season where low lagoon water levels over the critical growing period had a major impact on *Ruppia* biomass.

8.2.2 Landcare Research

Stephen Moore continues to work for Landcare Research in Auckland, and works from his home office and lab where he spends a large part of each year analysing freshwater invertebrate samples. His main areas of work are:

- identifying freshwater invertebrates sent by clients from all over NZ,
- assisting with AEEs and consent-related biological monitoring programmes,
- occasional overseas freshwater biological contracts (past projects in Fiji, Brunei, Papua New Guinea and Singapore).

Stephen continues his interest in photography of freshwater invertebrates and fish – every taxon he finds in his NZ or overseas projects is added to the photo collection (now containing several thousand images). These photos have been used to create an online resource designed to assist community groups carrying out stream monitoring, which is now available on <http://fwinverts.landcareresearch.co.nz>. The resource was funded by the Ministry for the Environment's Community Environment Fund, with contributions also from the Auckland Council and Taranaki Regional Council.

8.2.3 NIWA

NIWA Hamilton

Risky microbes in our waters

Graham McBride has continued his work focussed on microbial risk assessment. The national-scale study on "Campylobacter in Food and the Environment: Examining the Link with Public Health" has finally been put to bed (<http://www.foodsafety.govt.nz/elibrary/industry/examining-link-with-public-health/index.htm>).

Especially interesting to NZFSS may be the project's finding of the increasing importance of ovine and bovine strains of Campylobacter (poultry is now less implicated in its transmission than was the case prior to about 2006 at which time stricter controls were placed on that industry).

John Quinn continued to lead the Aquatic Rehabilitation Ministry of Science and Innovation (now the Ministry of Business, Innovation and Employment, or MBIE) programme and research on instream nutrient attenuation in the Cumulative Effects programme. The nutrient work has focused on the Tukituki River, where higher flows in the moist summer of 2011-12 reduced periphyton response to nutrient inputs and hence the removal of dissolved inorganic N and P from the water column. Nevertheless **Bob Wilcock** was able to measure elevated nitrous oxide and nitrogen gas, indicating that both denitrification and plant uptake contributed to the observed downstream attenuation of N. This work benefited from contributions by Canadian sabbatical visitors **Mike English** (Laurier, Waterloo), **Sherry Schiff** (University of Waterloo) and **Karyn Kidd** (University of New Brunswick). **Kit Rutherford** has incorporated the findings into a model that has been used to investigate likely effects of sewage diversion and irrigation-driven land use change on instream nutrient and periphyton levels. Sherry and Mike also contributed to studies on the effects of land use change and climate on nutrient export from the Whatawhata Integrated Catchment Management experimental sites.



Science picnic: Canadian Profs **Mike English** and **Sherry Schiff** working in the rain helping **John Quinn** (photographer) run in situ chamber measurements of nutrient removal/processing by periphyton in the Tukituki River, February 2012

Rob Davies-Colley leads a major strand of work (on variables, protocols and quality assurance) in Ministry for Environment's National Environmental Monitoring and Reporting (NEMaR) project, aimed at improving the consistency and dependability of Regional SOE monitoring of waters for national reporting. He also leads research on water monitoring and reporting as a subcontractor to Landcare Research in their 'Freshwater Values, Monitoring and Outcomes' programme which has strong links to NEMaR. He continues as scientific spokesperson for the National Rivers Water Quality Network (NRWQN) operated by NIWA, now in its 24th year. He is leading a large research project on sediment and water quality for which the main test bed is the Kaipara Harbour, where NIWA is working with Auckland and Northland Regional Councils to monitor fluxes from the catchment and effects on the harbour of fine sediment and related light attenuation and pollutants.

The Aquatic Pollution group: **Rob Davies-Colley**, **Rebecca Stott**, **John Nagels**, **Graham McBride** and **James Sukias** continue to work on zoonotic and microbial interaction and survival in stream sediments. They were joined in July by **Jennifer Drummond** (Packman Research Group, Northwestern University, USA) to contribute to current modelling of microbial contamination of pastoral streams.

Also at Whatawhata, John has helped **Aslan Wright-Stow** set up experiments on the enhancement of habitat and biodiversity in pasture streams using ponga log installations. These had immediate effects on organic matter retention, insect oviposition sites and hydraulic habitat diversity. Effects on biota are predicted over a longer time frame – if our installations remain in place!

John has contributed to the Environment Court Hearings on the land and water chapters of the Horizons One Plan. A highlight for the year was attending the Society for Ecological Restoration World Conference on Ecological Restoration, "Re-establishing the link between Nature and Culture", Merida, Mexico in August 2011 and presenting two talks on the Waikato River scoping study and the use of a Bayesian Belief Network to link community values and science knowledge on land development effects in the Hurunui. This experience produced a song called "Lucky break"

<http://www.youtube.com/watch?v=I57JxLmasl4&feature=relmfu>.



Richard Storey (NIWA) and **Kirsten Meijer** (Environment Southland) sampling remote streams in the Garvie Mountains, Southland

Richard Storey has been contributing to **John Quinn's** Aquatic Rehabilitation programme by using two different approaches to investigate insect abilities to recolonize restored stream reaches. One approach involves determining rates and distances of upstream crawling and flying, using experimental channels and intermittent streams as "blank slates" for colonisation. The other, in partnership with Taranaki Regional Council (TRC), uses GIS and 30 years of TRC monitoring data to detect invertebrate recolonisation following extensive riparian planting around the ring plain. Richard has also been leading the river biomonitoring work for the Freshwater Values, Monitoring and Outcomes programme (funded by the former Ministry of Science and Innovation (MSI), which is now called MBIE) and writing up the river biomonitoring section of the closely-related NEMaR project (both led by **Rob Davies-Colley**).

A highlight this summer was collecting invertebrates from alpine and glacier-fed streams in Otago and Southland with **Jon Harding** (University of Canterbury), **Kirsten Meijer** and **Roger Hodson** (Environment Southland). This Department of Conservation funded project was to fill data gaps in our knowledge of NZ freshwater invertebrate communities and validate the FWENZ classification system.

Back in the damp

Chris Tanner, after working mainly on constructed wetlands for water pollution management for a few years, is now back working in natural wetlands, taking over **Brian Sorrell's** role in Landcare Research's Wetland Ecosystem Restoration MSI (MBIE) Programme (led by **Bev Clarkson**) along with **Kerry Bodmin**, **Janine Wech**, **Kathy Kilroy** and others. A week of brilliant weather spent up in the O Tū Wharekai (Lake Clearwater) wetlands setting up a fertilisation experiment in three different plant communities in April was a great re-introduction. Here we are working alongside DoC (**Hugh Robertson**, **Rosemary Clucas**) and University of Canterbury researchers looking at the resilience of these wetlands to elevated nutrient inputs from agricultural intensification in the catchment. Chris has also been working with **James Sukias** on a wide range of applications of constructed wetlands for management of wastewaters, stormwaters and diffuse agricultural run-off (see publications). A highlight of this work was convening (with **Clive Howard-Williams**) the "Bringing Together Science and Policy to Protect and Enhance Wetland Ecosystem Services in Agricultural Landscapes" Symposium (funded through the OECD Cooperative Research Programme) held in conjunction with the 15th IWA Diffuse Pollution and Eutrophication Conference in Rotorua, 19-23 Sept. 2011. This brought together 13 key researchers from around the world who



John Quinn measuring small wood retention in a Whatawhata pasture stream (Kiripaka) prior to ponga wood installation. Photo: Aslan Wright-Stow.



Top: **Sophie Goodall** (undergraduate intern from Birmingham University) installing pitfall traps in an ‘intermediately’ flood-prone habitat within the Waimakariri River floodplain. Middle: **Hannah Franklin** painting Tanglefoot on sticky traps in the Waimakariri River bed within an ‘active floodplain’ habitat. The bank and in-stream emergence traps in the photograph were unfortunately not flood-proof. Bottom: Sticky traps (foreground) and emergence traps set within a vegetated spring habitat of the Waimakariri River floodplain. Photos: **Michelle Greenwood**.

worked on papers for a special issue of Ecological Engineering.

In 2012, **Aslan Wright-Stow** and **John Quinn** completed 20 years of monitoring small- and medium-sized streams in Whangapoua and Tairua Forests, Coromandel, where pine plantations are progressively logged. Briefly, they found that small streams were more sensitive to logging than larger streams, but also recovered more rapidly. The study also showed that impacts can be lessened by certain practices, such as leaving logging debris, or “slash”, over the streams. Aslan and John have also been adding wood to two agricultural streams in Whatawhata. The main aim is to determine if wood additions enhance the complexity of stream morphology and flow paths, thus improving habitat quality for invertebrates and fish and increasing natural retention of organic matter. Aslan and **Bob Wilcock**, in conjunction with regional council staff, have re-sampled streams in five “Best Practice Dairy Catchments” located in key geoclimatic dairying regions with specific challenges for farmers. Biological assessments 10 years after fencing and planting showed improved stream health in four of the five catchments, most likely in response to reduced sediment (and related pollutant) concentrations. Aslan has also continued to work on a range of marine and lakes projects in his capacity as a scientific diver.

NIWA Christchurch

Michelle Greenwood has been finishing her post-doctoral research with **Scott Larned**, investigating spatial patterns of terrestrial invertebrate biodiversity and their dependence on the presence of wetted channels across braided river landscapes, with the aim of identifying locations of joint aquatic-terrestrial invertebrate diversity and areas where terrestrial communities would most likely be affected by any loss of wetted channels. Her fieldwork and lab work are finished and manuscript writing is underway.

Phil Jellyman finished a one-year post-doc project with **Jon Harding** at the end of 2011 during which they investigated the impact of a proposed irrigation and hydro-electric scheme in the Hurunui River catchment, acid mine drainage effects on NZ fish species, and the role of didymo in altering stream community structure. In January 2012, Phil moved to NIWA Christchurch to undertake a two-year post-doc project working closely with **Doug Booker** and **Shan Crow**. The project aims to understand the response of freshwater fish communities to alterations in hydrological regime. Phil recently undertook a project to produce length-weight relationships for New Zealand’s freshwater fish species ... the

response from NZFSS members was phenomenal with over 250,000 records supplied! A huge thank you to everyone who contributed data and the results of this work should be published by the end of the year.

Don Jellyman has continued with research on freshwater eels, especially the completion of a 5-year study of movements of migratory longfin eels in Lake Manapouri (with **Jacques Boubée**, NIWA, Hamilton, and **James Holloway**, Meridian Energy Ltd). The acoustic arrays to provide 3D information on movements of individual eels worked extremely well, and have provided a database of 6 million detections. He has also carried out trials to estimate the population size of eels in a small lake, using combinations of PIT tag recaptures and radio tracking. Don has also been involved in a number of other studies (hydro impacts, coal mining), that have required presenting evidence at consent hearings and the Environment Court.

8.3 'Non-Governmental Organisations'

8.3.1 Fish & Game NZ

National Office

Bryce Johnson and **Neil Deans** have been kept busy with Land and Water Forum work, as well as a number of other activities. Neil now sits as a representative of the environmental sector on the Dairy Environment Leadership Group, reviewing the next version of the 'Dairy and Clean Streams Accord', as well as speaking at many seminars on water management issues and providing advice on the training of nutrient management advisors.

Northland

Rudi Hoetjes and **Nathan Burkepille** at Northland Fish and Game are pleased to have recently obtained resource consent to rewater the Wairua swamp just north of Whangarei. This swamp is a vestige of the once much larger Hikurangi swamp.

Auckland Waikato

Ben Wilson reports that in the Auckland/Waikato region, Fish and Game was successful in applications to the Waikato River Authority for funding to create a 20 ha ephemeral wetland on marginal farmland next to the Whangamarino Wetland, and the restoration of a 9.3 ha kahikatea wetland in the Fish and Game Piggott wetland near Pukekohe. The large restoration project on their Eastern Whangamarino Wetland continues and will not be completed until 2013. The disease botulism is becoming a major issue for waterfowl management in the Waikato with large kills of gamebirds and other waterfowl in several sewage treatment plants and in the lower Piako River. Fortunately the majority of treatment plants are seeking new resource consents with Fish and Game actively advocating for the inclusion of botulism/waterfowl management plans in each consent. However the botulism outbreak in the lower Piako River, close to the Miranda RAMSAR site, was most likely due to stagnant ponds being created by channel desilting work.

Recent surveys in the region's rivers have shown that brown trout are successfully spawning much further north than previously observed with large numbers of juveniles found for the first time in the streams flowing from the Coromandel Ranges.

Eastern

From **Matt Osborne**. Over the last twelve months, Eastern Region Fish & Game have been heavily involved with a number of angler creel surveys within the Rotorua lakes. The decline in water quality has been a hot topic for a number of years now (and remains so) and potential rehabilitation projects include engineering and chemical interventions. Fish & Game are monitoring the fisheries to assess any potential changes resulting from these actions. We have long term data sets from fish traps and angler creel surveys to undertake this. Opening Day surveys have been collected for over 30 years on some lakes. Over the coming summer (2012-13)

we intend to undertake another angler creel survey at Lake Waikaremoana as it has been 7 years since the last one was completed.

Our investigation into how trout liberations to Rotorua lakes should be timed in order to maximize trout growth and angler return is progressing well. The **“ZZ tagging trial”** involved releasing 500 tagged trout each month throughout 2010 into Lake Tarawera. Anglers have been returning tags from fish they have caught and the runs of spawning (3 year plus) fish through our Te Wairoa fish trap at Tarawera is ensuring good numbers of returns. The project will run for 1-2 more years before all tags can be assumed returned and the findings written up.

Fish & Game have continued to assist the University of Waikato with provision of trout samples (gut and otolith) from Lakes Rotorua, Rotoiti and the Ohau Channel to determine trout growth, movement, and contribute to Doctorate work on trout bioenergetics.

Eastern Fish & Game have been involved with the ongoing maintenance and upgrade of components for the Waikaremoana monitoring buoy. The data received is being used to look at lake generated effects on the trout fishery.

We are continuing to investigate habitat composition and trout recruitment within spawning streams around the Rotorua lakes. The project is designed to identify areas that rehabilitation work can be done to better improve wild spawning success.

After a number of years focusing on lake fisheries and water quality issues, Eastern Fish & Game have reinvigorated our drift diving programme. We have made a commitment to revisit several East Coast river fisheries to collect data that can be compared with historic records.

Fish & Game offer free wetland restoration advice and assistance as freshwater wetlands are significant habitats for game birds. Over this last year a lot of effort has gone into the Reporoa area due to a

perceived paucity of ducks. Fortunately we have been able to take advantage of funds from the WCEET and Waiariki Environmental Mitigation Trusts to assist in creating and enhancing existing game bird habitat in this area.

To boost duck numbers, we have been examining key habitat factors and the impact of regulations. We are looking to test some suppositions on habitat enhancement derived from an observational study of East Coast ponds. A recent transmitter study of mallards found low mortality from fledging to the opening of the game season; this was surprising as we had always assumed juvenile mortality to be quite high. Other habitat and monitoring initiatives have focused on the extensive network of drains across the Bay of Plenty. We have planted and created small enclosures on the sides of drains with the view to provide aerial cover for ducklings.



Eastern Whangamarino wetland, showing clearance of willows and wetland developments

Hawke's Bay

Ruataniwha Water Storage Project

Pete McIntosh reports that the Hawke's Bay Regional Council (HBRC) have completed a feasibility study into the building of an 80 m high, 90,000 cubic metre water storage dam in the main stem of the Mākaroro River. In October, HBRC voted to let the project move to resource consent application stage.

Loss of spawning habitat and barriers to fish migration on a major tributary of a nationally significant trout fishery is of concern. Whilst we are concerned about this, we see the primary issue in this project being the land use intensification of some 30,000 ha as a result of the supply of irrigation water from the reservoir (currently only 6,000 ha is irrigated). This intensification and all of its associated non-point source runoff is of major concern to many members of the community. As the Tukituki River is already in a stressed condition due

to current irrigation and associated land use, over allocation of surface water and ground waters in deficit of 66 million cubic meters, any further stress on the system could have irreversible effects.

Central Hawke's Bay Waste Water

Two significant point source pollution sites in the Tukituki River catchment are the wastewater and effluent discharges into the Tukituki and Waipawa rivers from the Central Hawke's Bay townships of Waipukurau and Waipawa. There has been an on-going battle since an Environment Court decision was made in 2008 to make the Central Hawke's Bay District Council (CHB) meet effluent discharge consent conditions by September 2014. Since then the HBRC has tried to assist CHB in meeting short falls in funding and help come up with solutions (namely land based treatment), but the CHB has been indecisive in any direction, approach and method they will

use to meet the consent conditions. Correct decisions need to be made quickly to allow construction of whatever system is selected, before the environment court discharge consent conditions come into play. Other treatment methods that have/are being considered include worm farms, floating wetlands, as well as the land based treatment option provided by the HBRC.

Long Term Plan

Submissions for the HBRC draft Long Term Plan change for 2012-2022 closed in May and were heard in June. This was followed closely by submissions on the Tukituki Catchment Plan change, which closed in August. The Tukituki catchment plan which will be the template for other catchments in the region (Ngaruroro, Tūtaekuri and Mōhaka), making it a priority to get right.

Ngaruroro Water Conservation Order

A Water Conservation Order application will soon be made for the Ngaruroro River. Joint applicants will be Fish & Game, Forest & Bird, local hapū along the length of the river and hopefully HBRC. Two sites for water storage dams on the Ngaruroro have been identified in a feasibility study.

Eskdale River

TrustPower have begun to install two run of the river hydro generation units in the upper Esk and hope to have them operational before the end of the year.

Upper Mōhaka



Taranaki angler Craig McEwan with a lower Pātea River brown trout



Banding Mallards

The Taharua/Upper Mōhaka catchment still has major water quality issues from four dairy farms in the area. HBRC with pressure from stakeholders and the public have widened the area of concern to cover the entire catchment, which now includes the Waipunga and Ripia.

Lake Poukawa

Ground water and the radial gate control structure consents are up for renewal and Fish & Game are working with local growers and landowners to get sustainable long term protection for the shallow lake and associated ephemeral wetland.

Taranaki

Allen Stancliff reports that following re-consenting of TrustPower's Pātea hydro scheme, Taranaki Fish & Game has been involved in TrustPower funded studies to determine the effects of the power scheme on trout populations in the Pātea River downstream of Pātea Dam. Initial studies have focussed on trout spawning and recruitment, with electric fishing and spawning surveys being undertaken by **Glenn McLean** from Technically Trout. So far it's looking as though there is only very limited or no natural recruitment of trout in the lower Pātea River and reasons for this are being investigated. It is likely there is some recruitment to the lower river from brown trout populations present in the Pātea catchment upstream from the 46 km long Lake Rotorangi, with juveniles either going over the spillway during flood events or surviving passage through the power station turbines.

Wellington

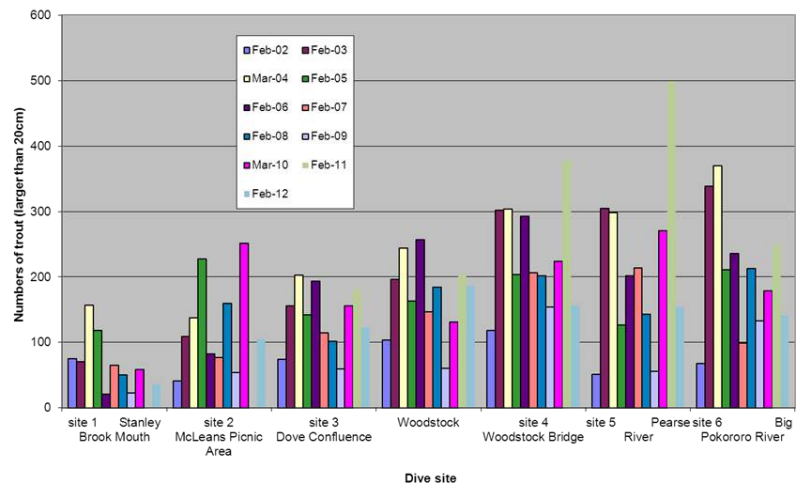
The Wellington region has been absorbed with the Environment Court proceedings on the Horizons One Plan, which were finally completed in mid-June. **Corina Jordan** has coordinated this case, in conjunction with other parties such as DoC. She has also been working on some of her PhD work looking at changes in salmonid populations in a variety of rivers in the region, particularly analysing otoliths in the Manawatū and Mangatainoka Rivers, to establish the importance of spawning tributaries. Otoliths are also being analysed for their microchemistry in the upper Rangitīkei River.

Nic Cudby and **Phil Teal** have provided advice to the Government funded Wairarapa Moana project, particularly on spraying and water level management. Wellington Fish and Game staff have also been assisting in the oversight of a variety of wetland development projects that were funded by the Gamebird Habitat Trust, and participating in a national mallard duck banding project.

Nelson Marlborough

Fish and Game, together with other parties including Federated Farmers, has been concerned about plans to remove hundreds of kilometres of willows beside the Motueka River. The reason is for biosecurity, given that crack willows are now an unwanted organism, but the effectiveness of this control is doubtful when there are many willows remaining in tributaries upstream. Riparian margins would be vulnerable until any alternative species are established, which may not necessarily happen. *[The editor notes that there are means of poisoning willows that allow for the banks to remain stable while new species establish.]*

Densities of Brown Trout (>20cm) in the Motueka River



Motueka River Trout biomass

Fish and Game has continued its detailed drift dive programme in the Motueka River to measure both the effectiveness of drift diving as a technique and how well it has reflected changes in trout biomass in the Motueka over the last twenty years. Given the suitability of the Motueka at producing close to ideal trout growing and survival conditions, as shown through the integrated catchment management research programme, it

has been intriguing how the fishery has changed over the last 25 years. During the late 1980s and early 1990s, the fishery was characterised by high numbers of relatively small fish. The population crashed following a major flood in the upper Motueka River in 1995 and remained low for about seven years before increasing through the mid 2000s and dipping again in 2009.

Changes in the efficacy of drift diving as a technique can be seen from the data from six randomly chosen sites in the lower Motueka monitored annually since 2002. Interannual variability within and between sites can be quite large, but overall numbers increase in a downstream direction as the river becomes larger.

Para Swamp

Fish and Game are reviewing the management of the Para swamp, the largest freshwater wetland in Marlborough. The NZ Gamebird Habitat Trust has reviewed its work nationally and considers the Para to be its highest priority for future assistance, so is working closely with the region in this project and assisting with funding. A further small area of 5 ha was purchased by Fish and Game, with support from Trust, which means all but about 15 ha of the 120 ha wetland is owned or administered by Fish and Game. Willows have been aerielly sprayed in compartments over the last 4 years, with further work required to follow up and provide access to different areas for revegetation with kahikatea and flax to supplement the few remaining adult trees.



Mucking in to help the waterways: **Vaughan Lynn** cutting hawthorn, Para Swamp (left) and Golden Bay Streamcare planting the Harwood property (right)

Rhys Barrier continues his work providing advice on freshwater biodiversity, funded by the Biodiversity Condition Fund. An example of his work is that of the riparian planting programme at a Harwood property in upper Takaka, with planting being undertaken by Golden Bay Streamcare.

Lawson Davey continues his involvement with Cawthron researching trout production and survival in the Rainy River, a trout spawning and rearing tributary in the upper Motueka River catchment. This has, amongst other things, looked at the influence of flows in a trout spawning/rearing tributary on the survival and recruitment of juvenile fish. As many of these have been PIT tagged, it has also looked at different ways of monitoring tagged fish. This work continues, with particular interest as to whether some of the fish originally tagged as juveniles will be returning to their natal rearing tributary.

Lawson Davey and Vaughan Lynn are negotiating with TrustPower to confirm the method of maintaining trout populations in the upper Branch River. This may be a combination of trap and transfer of fish around the existing fish pass as well as restocking.

West Coast

Dean Kelly and **Rhys Adams** have been conducting salmon and trout spawning surveys and drift diving to assess sports fish population levels in selected catchments. They have also initiated a long term programme to ascertain the factors affecting trout abundance in the Māwheraiti River. They have installed temperature and flow measuring equipment as well as looking at water quality and trout abundance four times a year, and researching the varying life histories of different sized fish in South Westland using otoliths. They submitted on the West Coast Regional Council's Land and Water plan and continue to advocate for clean water in the statutory planning process. They also successfully applied for funding from the Biodiversity Condition Fund to fence stock out of Māhinapua Creek, which has subsequently been completed.

North Canterbury

Staff in all three Fish and Game regions bounded by the Canterbury Region have been extensively involved in the Canterbury Water Management Strategy process, with **Tony Hawker** in particular contributing a great deal of his time to this work.

As well as adjusting to massive post-earthquake changes, there have been significant staff changes at North Canterbury, with **Ross Millichamp** stepping down as Manager to become a Fish and Game officer and being replaced by **Rod Cullinane**. **Emily Moore** is now taking parental leave and **Tony Hawker** is shifting from resource management to replace **Brian Ross** as a Fish and Game officer.



Rhys Adams measuring trout in Lake Brunner (top) and drift diving the Grey River (bottom)

An exciting project for North Canterbury and the South Island regions generally is the development of the Isaac Hatchery near Christchurch, which Fish and Game aims to use to provide stocks of fish throughout the South Island, coordinated by Hatchery Manager **Dirk Barr** and **Steve Terry**. It will also provide salmon for kids' fishing events and to work with school programmes rearing fish for educational purposes.

Central South Island

Species & Harvest Monitoring

Manager **Jay Graybill** reports that aerial monitoring of salmon spawning using the NIWA model shows spawning trends remain relatively low. Transect counts of dabbling ducks show an upward trend, indicating populations are sustainable under current hunting regulations. This increase likely results from a significant increase in "open water" habitat with construction of on-farm storage ponds estimated at about 300 new ponds in Mid-Canterbury. In the Gamebird Harvest Survey, the Central South Island (CSI) continued to top all regions in terms of hunter success at about 1.5 birds per hour.

Habitat Management & Restoration

A major side-braid restoration project is underway on the Lower Waitaki to restore and enhance juvenile salmon rearing habitat. Major willow clearance, flow enhancement, and fencing projects are underway in the Upper Rangitata to protect important salmon spawning habitat.

RMA

Resource Officer **Zella Smith** has been kept very busy with Canterbury water issues, with **Jay Graybill** on the regional committee keeping an overview of issues.

In the Upper Waitaki (including the Ahuriri Water Conservation Order area) decisions have been pending for 110 applications (60 for water permits and 50 for associated land use and by-wash permits). Decisions on 47 water permits have been released, with 10 water permits being declined. Most of those declined were for "new water" abstractions in the Ahuriri Catchment.

Activities for the CWMS continue a-pace under the ECan Act. The key principles of the CWMS are to restore water quality and quantity, improve water use efficiency, and to develop storage infrastructure. Long-

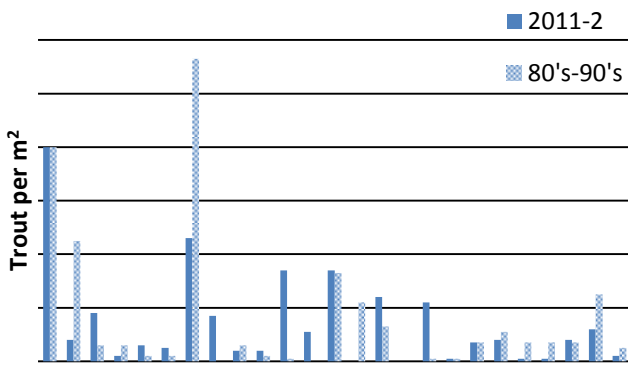
term targets have been described in the CWMS under 10 titles. Canterbury has been divided into 10 zones, each with a "zone committee". There is a "Regional Water Committee" at the regional level. Each committee, zone and regional, is charged to implement the CWMS for their respective area of interest and in line with the CWMS targets. A number of zone committees have produced draft reports called "zone implementation programmes" (ZIPs). The draft "Regional Implementation Programme" (RIP, the regional committee's report) has been presented to the Canterbury Regional Council. CSI Staff and Councillors (and North Canterbury F & G) are actively involved with most of these committees.

Otago



North Canterbury Hatchery Manager Dirk Barr showing salmon ova to school children in Christchurch

O+ trout density in Southland streams 1980-90 and 2012



In Otago the fish and game workload is still dominated by upcoming regional water plan changes on wetlands, water quality and setting minimum river flows. Fisheries survey work on the Lindis River (**Cliff Halford**), Manuherikia River (**Clare Morris**), Sowburn and Kyeburn (**Steve Dixon**) is all aimed at providing a better information base for minimum flow setting. **Peter Wilson** has been working on appeals to the Environment Court over changes to the Regional Plan relating to wetlands, and submissions on Otago Regional Council's plan change on water quality. **Niall Watson** prepared evidence for the Environment Court in support of the amendment to the Kawarau Water Conservation Order to completely prohibit dams on the

Nevis River – Central Otago District's last wild river.

Otago Fish and Game staff are involved in catchment groups in the Taieri and Manuherikia and are working towards replacement of mining privileges, which are the current basis for many historic water takes, and which expire in 2021. Those groups are also concerned with water supply for irrigation and environmental management. **Morgan Trotter** is working in South and West Otago as well as Coastal Otago on a variety of issues including a proposed irrigation dam (Shag River), water quality problems and proposed minimum flows on the Pomahaka and Waiwera Rivers.

Rasmus Gabrielson has left to work for Cawthron Institute and has been replaced by **Clare Morris** in Central Otago.

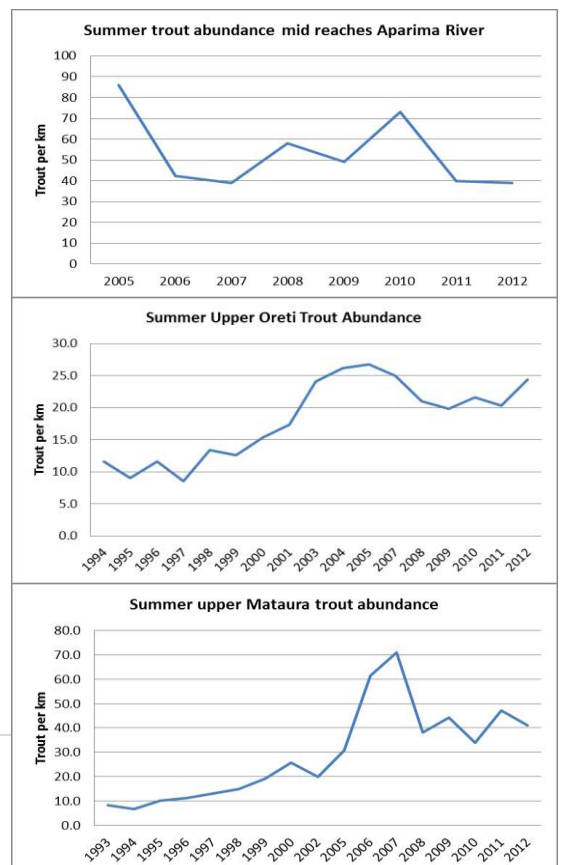
Southland

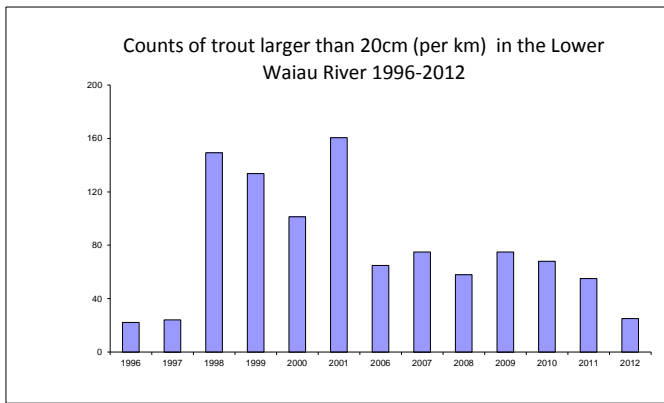
Over the 2011-2012 summer, **Cohen Stewart** (Otago University) and **Maurice Rodway** conducted electrofishing surveys in 25 lowland and hill streams in the region to compare results with historical survey data from 1980 to 1997. Ten of the sites surveyed had higher densities (>50%) of juvenile brown trout in the present surveys, 10 had lower densities, while 5 sites remained about the same or had no trout (see graph). Further surveys are planned to investigate habitat parameters that may be related to the differences observed.

Bill Jarvie, Stu Sutherland, Jacob Smyth and Zane Moss conducted drift diving surveys of the mid reaches of the Aparima, Oreti and Mataura rivers in Southland to add to the long term data set already obtained for the adult trout populations in these rivers (see graphs to right).

Effects of didymo on trout

The drift diving team along with assistance from Otago Fish and Game staff conducted surveys of trout abundance in the Upper and Lower Waiau Rivers. The lower Waiau (median flow 16 cumecs) has been severely affected by didymo after infestation in 2004. In the last few years trout abundance has been reduced compared to the period after the restoration of minimum flows required by the Manapouri Power Scheme resource consents. Minimum flows were reinstated after 1997.





By contrast the Upper Waiau River, which is also affected by didymo but has a median flow of 350 cumecs, does not appear to have had a reduction in its trout population. The Upper Waiau population sits around 300-400 per km, which is typical of other large lake outlet rivers.

8.4 Unitary authorities

8.4.1 Environment Southland

The science team at Environment Southland is in a state of flux. Additions or alterations include **Karen Wilson** (now Principal Scientist, was senior groundwater scientist), **Andy Hicks** (new Aquatic Ecologist), **Lawrence Kees** (new Surface Water Quantity scientist) and **George Ledgard** (new soil scientist). Departures include **Jane Kitson** (ex-senior surface water scientist, now at Te Ao Marama Inc.), **Steven Ledington** (ex- surface water quantity scientist, now at Rayonier), **Greg Larkin** (ex-coastal scientist, now full time surfer), **Dianne Elliott** (groundwater technician, still at ES but now senior hydrology technician). **Roger Hodson** (Living Streams scientist) left temporarily but came back to the same role. **Kirsten Meijer** (surface water quality scientist), **Clint Rissman** (groundwater quality scientist) and **John Prince** (Environment Information Manager) are the only positions unchanged since the update in 2011.

The end of 2011 saw the completion and release of Environment Southland's remaining **SOE Water** reports. These included 'Our Health', 'Our Ecosystems', 'Our Uses' and 'Our Threats'. These were received with some contention, and an external peer review of the science methodology used in Our Ecosystems was undertaken to help validate the conclusions about the state of the environment that were presented in the reports. The methods were considered robust, and the council are now embarking on the slow road to help improve the marked deterioration in regional water quality that was identified in these reports.

Waituna Lagoon remains a focal subject, with modelling by the University of Waikato almost complete. This will help guide a review of the Interim Lagoon Guidelines by the **Lagoon Technical Group** in terms of the load reductions required to improve the health of the lagoon. The **Catchment Technical Group** has also begun to identify how land use in the catchment relates to loadings to the lagoon and will be generating some interim recommendations.

Other work has included updated habitat mapping reports for estuarine and coastal areas along the south coast, Waikawa catchment faecal source study, an update of five year regional median nitrate trends for groundwater, a groundwater investigation in the lower Waiau catchment, Aparima River water balance and generalised habitat modelling, preparation of an Envirolink Tools application for bioenergetics modelling, a final report on the Sandstone Living Streams catchment, drain clearing investigations and effects on water quality and native fish, coastal lakes monitoring and an investigation into faecal sources in the Otepunui Creek catchment.

8.4.2 Greater Wellington Regional Council

Staff changes

Dr Claire Conwell started in June last year (replacing **Sheree Tidswell**) and oversees the groundwater quality monitoring programme. Originally from Melbourne, Claire specialises in ecotoxicology and previously worked for Cawthron. **Sheree Tidswell** stepped back into her old role in February this year while Claire went on

maternity leave. **Dr John Drewry** joined Greater Wellington’s environmental science team in January, taking up our senior land scientist role. John worked at AgResearch for 10 years prior to shifting to Australia to complete his PhD in catchment water quality modelling. In March this year **Graham Sevicke-Jones** returned to the Wellington region, leaving his science manager role at Hawke’s Bay Regional Council to head Greater Wellington’s Environmental Monitoring and Investigations Department.

State of the Environment (SOE) river and stream monitoring

The summer river and stream SOE fieldwork (macroinvertebrate and periphyton sampling at 55 sites, as well as biofilm sampling at a selection of these sites) was completed in mid April, overseen by **Alton Perrie**. In almost an exact replay of 2011, regular rainfall events hampered repeated attempts to sample many sites – especially our smaller urban stream sites in Wellington city and Porirua.

Fish surveys have been undertaken at a number of sites across the region to fish sites with no or few existing records, re-fish sites with historical records of threatened fish, and to establish long-term monitoring sites using standardised fishing methods (150 m of stream fished using one-pass electric fishing).

State of the Environment (SOE) reporting

Coordinated by **Juliet Milne**, in early June 2011 we publicly released our 5-6 yearly SOE state and trend reports covering all resource areas, including river and stream water quality and ecology, lake health, freshwater allocation/hydrology, and soil, groundwater and recreational water quality. There are also reports on air quality and the coast. The eight technical reports were rolled out with a summary leaflet pack for the general public detailing key findings about the region’s air, land and water resources on a sub-region (or ‘super catchment’) basis covering the Kapiti Coast, Porirua Harbour, Wellington Harbour (including the Hutt Valley), Wairarapa Valley and the eastern Wairarapa hills.

Download the reports from www.gw.govt.nz/ser

Fishable, swimmable, dog-walkable?

Benthic cyanobacteria were once again a problem in the Hutt River during the summer, with widespread growth (up to 80% cover of the river bed) recorded from late

January until late February during an extended period of low flow. Although warning signs were put in place along the river and numerous press releases issued, two dogs died after coming into contact with the algae in the river near Heretaunga Park and Melling Bridge. At a subsequent meeting between Greater Wellington, territorial authority and Regional Public Health staff it was agreed that a more detailed cyanobacteria risk communication strategy than currently exists is needed. Greater Wellington’s Communications department will lead the development of the strategy which will set out the responsibilities of each organisation and explore options such text/email alerts for licenced dog owners and targeting specific groups for general education regarding the risks associated with cyanobacteria (eg schools, dog owners clubs, vets).



Shyam Morar (obscured), **Alton Perrie** and **Brett Cockeram** electric fishing the Enaki Stream, a tributary of the Mangatāre Stream (Carterton). Photo: GWRC

Greater Wellington, together with several other regional councils, is continuing to help fund **Mark Heath's** PhD benthic cyanobacteria research.

A report documenting updated Suitability for Recreation Grades (SFRGs) for recreational water quality monitoring sites was publicly released in early June. In the report, lead author **Summer Greenfield** established 'dry weather' SFRGs for fresh water sites which exclude microbiological test results from water samples taken during high river flows on the basis that this better reflects water quality at the time when most people swim.

Water quality and ecological investigations

Alton Perrie co-ordinated a year-long investigation into water quality in the Pahaoa River catchment in the eastern Wairarapa, ending in June this year. Plans to investigate the water (and nutrient) balance of Lake Wairarapa in the 2011-2012 summer – with the view to informing the review of water allocation policies needed for the new Regional Plan – were upset by unsuitable weather and hydrological conditions. However, two of three proposed new meteorological stations were installed, one on each of the western and eastern shores of the lake. A central lake station will be installed next. Station sensors include automatic tipping bucket and storage rain gauges, wind speed and direction, solar radiation and air temperature. The primary aim of the stations is to improve the resolution of data from which evaporation estimates from the lake can be made. A sideways-looking acoustic doppler unit is also being installed at the lake outlet channel to provide a continuous measure of flow. It is intended that all instrumentation is installed and calibrated prior to the 2012/13 summer when an integrated programme of tributary flow gauging and water quality sampling is planned. In terms of the groundwater component of the investigation, water level is being continuously logged in 11 spearpoint shallow monitoring bores installed at several locations around the lake shore. Seven of these spearpoints will also serve as water quality sampling points to investigate groundwater nutrient inputs to the lake. Contact **Mike Thompson** or **Doug Mzila** for more information.

Instream flow assessments and hydrological investigations

Led by **Mike Thompson**, work continues on compiling instream flow assessment work for the review of Greater Wellington's existing regional plans. The report "Cultural values for Wairarapa Waterways" by **Caleb Royal** of Ohau Plants Ltd (and funded through the Community Irrigation Fund to assist in the identification of in-stream values) was recently completed. The report will help inform the wider work on setting minimum flows in rivers and streams and is a valuable resource for anyone with an interest in Wairarapa waterbodies.

In addition to reviewing minimum flows and core allocation, an expert panel was convened late in 2011 to discuss options for supplementary (mid to high-range flow) allocation thresholds for the new regional plan. Several potential options were identified and further examination of these is planned.

A discussion document on the merits of a new minimum flow assessment for the Waikanae River was completed by **Mike Thompson** in March. The findings from this report are being fed into a summary report on recommended minimum flows for the region that can be used to help develop policy options for the new Regional Plan.

In May we received the final report from consultant **Keith Thompson** on the condition of 10 wetlands in the region thought to be vulnerable to water abstraction. The assessments have looked at wetland hydrology, vegetation condition and water quality, and includes both threats to these and recommendations for improved management and monitoring.

Regional Plan 'limit setting' work

Summer Greenfield has continued to oversee technical work on defining default numerical objectives/targets for river ecology, water quality and habitat quality for Greater Wellington's new regional plan, while **Mike Thompson** has coordinated the science input for freshwater allocation. After initial work on a regional scale, technical work is now shifting to a sub-region or 'super catchment' basis.

‘Clean-up and restoration’ projects

After a successful application to the MfE Fresh Start for Fresh Water Clean-up Fund, a two day workshop was held in April to discuss existing knowledge and understanding of Lake Wairarapa’s edge wetlands and their management. The funds will be directed towards improving the health and functioning of a selection of the lake’s wetlands. **Graham Sevicke-Jones** and **Philippa Crisp** are currently overseeing Greater Wellington’s science input to the project.

Work continues on the Mangatāre Stream catchment pilot programme (an outcome of the Mangatāre Stream catchment water quality investigation completed in 2010), with a community group committee now established. Separate to this, Greater Wellington has been assisting GNS Science with research to extend the knowledge of surface water-groundwater interactions as well as investigating the sources and fate of contaminants using the Mangatāre catchment as a model. Our contribution to the study, coordinated by **Claire Conwell**, has involved the facilitation of field sampling and the collection of water samples from six groundwater bores in areas previously sampled during our comprehensive catchment investigation. GNS is in the process of analysing these samples to determine the ratios of H and O stable isotopes in water, and N and O isotopes in nitrate.

Greater Wellington, together with Porirua City Council, Wellington City Council and Ngāti Toa, publicly launched the Porirua Harbour and Catchment Management Strategy and Action Plan in April 2012. The strategy has as its vision “A healthy harbour and waterways” and is focussed on addressing key issues around sedimentation, pollution (both stormwater inputs and eutrophication) and habitat restoration. Greater Wellington’s main science focus over the past year, coordinated by **Juliet Milne** and **Megan Oliver**, has centred on improving our understanding of sediment inputs to, and sediment deposition in, the harbour. As part of this, continuous turbidity monitoring has been installed on the lower reaches of Porirua Stream – a major tributary of Porirua Harbour – in close proximity to our existing stream flow recorder. Sensors are to be installed on the two other main tributaries early in 2012/13 so that we can determine sediment loads entering the harbour from earthworks, forestry and other development/activities further up the catchment.

8.4.3 Auckland Council

Graham Surrey has been working closely with NIWA Christchurch to develop a predictive inanga spawning model for the Auckland Region. This combines information from Auckland Council’s LiDAR-derived digital elevation model and NIWA’s tidal modelling to produce GIS layers predicting the likely location of spawning areas throughout the region. Work has also been carried out in conjunction with NIWA Hamilton to survey a range of Auckland rivers for the presence of lamprey, utilising passive in-stream samplers to detect the presence of species-specific pheromones.

Martin Neale has coordinated the review of the Stream Ecological Valuation (SEV), involving scientists from Councils (Auckland and Waikato), Massey University, Landcare Research and NIWA. The outcomes of the review are a method that has been streamlined and simplified without losing any important information, and a revamp of the supporting materials, including a brand new illustrated user’s guide printed on materials designed to survive being used in the field. All of the supporting materials are available free of charge from the Council’s Technical Publications page, with further information available (and copies of the user guide) from sev@aucklandcouncil.govt.nz.

Martin has also continued to work with **Prof Gillian Lewis** and her team at the University of Auckland to better understand stream bacterial communities and evaluate their use as indicators of stream health. The project has involved seven Councils (Auckland, Waikato, Greater Wellington, Tasman, Canterbury, Hawke’s Bay and Horizons) contributing funding, resources and samples, leading to the collection of stream bacterial

samples from 254 sites across the country. A recently published report is a major output of the project to date (TR2010/068). The report documents the development of the Bacterial Community Index (BCI), a tool for assessing the health of a stream based on the bacteria present in the biofilm. The team is continuing to work on refining the BCI model and Martin will continue working on this project at the University in association with a honorary lectureship awarded by the School of Biological Science.

8.4.4 The Hawke's Bay Regional Council

Staff changes

Iain Maxwell (ex Cawthron) replaced **Darryl Lew** as the Resource Management Group Manager. **Neale Hudson** (ex NIWA) replaces **Graham Sevicke-Jones** as the Science Manager. Neale started early June 2012. **Thomas Wilding** (Ecohydrologist) recently started with the Hydrology team as their new senior scientist after completing his PhD in Colorado, USA.

Water Quality and Ecology Team

The Hawke's Bay Regional Council Water Quality and Ecology team increased sampling effort on the Tukituki River catchment this summer, adding to a busy SOE and Recreational Water Quality monitoring programme.

Vicky Lyon has been collecting weekly periphyton data on four sites in the Tukituki River to increase our understanding of algal biomass accrual rates in the river and how biomass changes in relation to flow. **Dan Fake**, along with Vicky, has been coordinating sampling of additional sites within the Tukituki catchment to infill gaps and inform water quality limit setting for the Tukituki Plan Change.

We have also increased our effort around the SOE rivers programme by collecting visual and biomass data for periphyton at each site. Full quantitative taxon lists and counts have also been prepared for invertebrate samples. Water quality monitoring has been undertaken at 72 river sites, of which 65 have also been subject to macroinvertebrate and periphyton assessment.

Nina von Westernhagen and **Shane Gilmer** have been busy with the SOE lakes monitoring programme at Lakes Rūnanga, Oingo, Opouahi, Waikapiro and Tūtira. Shane fielded a large number of phone calls over the status of the summer algal blooms at Lake Tūtira and continues to monitor numbers of cyanobacteria in the lake.

Sandy Haidekker has continued her work with the Freshwater Ecosystems of New Zealand (FENZ) model, testing the model predictions with SOE-assessed data. In general, MCI scores were predicted very well for Hawke's Bay SOE sites. She then compared modelled FENZ data with data from SOE and SEV (Stream Ecological Valuation) reports in detail for the Karamu catchment to analyse differences between predicted and assessed parameters. She observed assessed MCI scores at a number of Karamu Stream sites to be significantly lower than those predicted by the FENZ model. This suggests that there are additional stressors on the catchment over and above those accommodated for in FENZ.

Fiona Cameron has been coordinating the fish monitoring programme to ensure necessary information is available for the regional plan changes for the Tukituki and Mōhaka River catchments. Fiona continues to identify fish passage issues and mitigation measures. Recently she organised for a fish friendly gate to be fitted at Muddy Creek wetland to restore migratory pathways. In addition Fiona has completed ecological monitoring of the health of HBRC's council-owned wetlands and has recently applied the national monitoring protocols to assess their condition prior to and post management. These results indicate an improved ecological state through targeted management by Council.

The next twelve months sees the SOE Rivers programme moving from a mix of monthly and quarterly sampling to monthly sampling across the whole region. This positive development is the outcome of a recent commitment made by Council through the 2012 Long Term Plan to improve Council's capacity to assess change over time through improved long-term monitoring.

Hydrology Team

The Hydrology team have been kept busy over the last twelve months providing information to the HBRC Policy team to support plan changes for the Tukituki River and Mōhaka River catchments. On top of this was scoping for the next Long Term Plan period.

Significant time and effort has been placed on coupling the Ruataniwha Groundwater Transient model outputs with the Surface Water flow record and using the subsequent records as a predictive tool to run different water management scenarios within the Tukituki Catchment. Also underway is a large scale concurrent gauging programme on the Mōhaka River catchment.

8.4.5 Waikato Regional Council

Bruno David has continued to develop Waikato Regional Council's CarP-N neutral project which involves the removal and conversion of koi carp flesh via thermophilic protein consuming bacteria into fertiliser for propagating native trees. Planting trials conducted on native trees over the last 6 months indicate promising results with 10 and 20% carp performing as well or better than control mixes with no carp. Recent allocation of Waikato River Authority funding has been awarded to purchase a digester and for establishing a demonstration site at Lake Waikare in 2012/2013. Bruno has also been conducting further investigations into the use of mussel spat ropes for facilitating fish passage through long non-perched culverts, in association with **Jono Tonkin** from Bay of Plenty Polytech. 'Swimming' fish species such as inanga are being tested at a range of culvert gradients and lengths. Preliminary data are very promising with successful passage through 6 m culverts at 1.5 degree slope only possible when ropes are present.

Mark Hamer has been co-ordinating the SOE Regional Ecological Monitoring of Streams (REMS) sampling which this year commenced the second round of random site sampling for a 3-year rotating panel. This year, Bruno and Mark, with the help of **Kris Tapeti** and **Steve Scothern**, have incorporated fish monitoring into the REMS programme. Fifty sites (40 random, 10 reference) were electro-fished this year using standardised protocols to add fish information to other routinely collected invertebrate, water quality and habitat information. Fish data were collected over continuous 150 m reaches and included data on fish length, relative abundance and diversity (native and exotic) for future SOE reporting. Mark has also continued the development of our ecological database which currently houses invertebrate, fish and habitat data, with the help of **Sarah Cross**.



CarP-N neutral project with digester in the background.

Kevin Collier has continued investigations into non-wadeable river macroinvertebrate sampling methods and indicators with **Mark Hamer**, in collaboration with Cawthron Institute. Application of a probabilistic sampling design to 30 non-wadeable river sites has indicated that GPP, decay rates and selected macroinvertebrate metrics can show linear or non-linear responses to landcover pressure in non-wadeable rivers. Kevin has also been investigating response differentials of non-wadeable rivers relative to wadeable streams to test whether this approach could provide an alternative benchmark for assessing non-wadeable river health. He recently presented a paper on this topic at the Society for Freshwater Sciences conference in Louisville, Kentucky. Kevin has also been writing up the results of Waikato Regional Council's SOE ecological monitoring network for 2008-11, which includes a probabilistic component to provide an unbiased estimate of the condition of the region's non-tidal perennial wadeable streams on developed land.

Tracie Dean-Speirs has settled in to her role as the Lakes Management Officer and has organised the installation of weirs at two Horsham Downs lakes over the last year, as part of Waikato Regional Council's Lake Level Setting Programme. Tracie continues to work with other agencies on the management of shallow lakes within the region, through the Waipa Peat Lakes & Wetlands Accord and the newly established Memorandum of Agreement for lakes and wetlands in the Waikato District. Tracie is co-ordinating a project under the Waipa Peat Lakes Accord that focuses on land uses in several peat lake catchments which is jointly funded by Waikato Regional Council, Waipa District Council and the Department of Conservation. This project involves the preparation of whole farm system management plans for properties within the lake catchments to identify options for reducing nutrient and sediment losses to the lakes. The University of Waikato is monitoring the water quality inflows to assess catchment inputs. Tracie is also working on a Shallow Lakes Management Plan covering a diverse range of Waikato's shallow lakes and has had the opportunity to visit little known lakes in the region through the Shallow Lake Health Monitoring Programme.

Tracie also works closely with other Council staff involved in riparian fencing and planting around the lakes, including large projects at Lakes Mangahia, Maratoto, Harihari, and Waahi. **Paul Smith** (Waipa), **Adrian Jepson** (West Coast) and **Elaine Iddon** (Lower Waikato) are the main Land Management Officers involved in these projects. Waikato Regional Council continues to support **Rebecca Eivers'** PhD research project that investigates options to mitigate sediment and nutrient input to peat lakes. This year the Council, DoC and Kauri Parks Nurseries jointly funded the installation of floating wetlands in two silt traps at Lake Kaituna so that Rebecca can assess their potential application in these environments.



Stephen Scothern posing with large longfin eel caught at one of 40 randomly selected sites sampled using standardized electric fishing methods (150 m long reach) as part of Waikato Regional Council SOE monitoring. Photo: **Kristopher Taipeti**.

8.4.6 Taranaki Regional Council

The team

Mathew Curran, Policy Analyst, and **Chris Spurdle**, Planning Manager, are both involved in the review of the freshwater plan. **Katrina Smith**, is the Scientific officer Freshwater Biology. **Regan Phipps** is the Scientific officer for Surface and Groundwater Resources. **Warrick Johnston**, and **Thomas Brackenrig** are both Hydrology Officers. **Keith Brodie**, Monitoring Manager, is responsible for the behaviour and performance of the Scientific Officers and staff. **Alex Connolly** is Scientific Officer for State of the Environment Monitoring programmes. **Chris Fowles**, Scientific Officer Water Resources, leads various State of the Environment Monitoring (SEM) projects and performs biological macroinvertebrate and other consent monitoring. **Bart Jansma**, Scientific Officer Freshwater Biology, juggles fish pass investigations with periphyton SEM and investigations into effects of riparian restoration and hydroelectric power scheme consent monitoring. **Ray Harris**, Technical Officer, gathers the samples for several SEM programmes along with **Amy Cameron** who works between departments. **Fiona Jansma**, Scientific Officer Hydrology, leads the hydro team on a part-time basis.

Freshwater Contact Recreational Programme

There were relatively few exceedances of *E. coli* action levels at the 16 freshwater sites monitored for bathing/recreational water quality from November 2011 to April 2012, and the majority of those exceedances were linked to extensive wildfowl sources via microbial source testing techniques. The total number of samples falling within the “Alert” or “Action” categories was 6% lower than the average of all the previous seasons, continuing the improvement shown in the 2010-11 season. Lake Rotokare has experienced cyanobacteria problems but this year was an exception, with cyanobacteria not exceeding health standards. With little inflow or outflow cyanobacteria levels can get quite high; the low counts this year may be related to very wet conditions in spring.

State of the Environment Monitoring Macroinvertebrates

Biological Surveys were performed at 57 sites in 25 rivers and streams. The macroinvertebrate communities at all ringplain sites have also been assessed in terms of predictive relationships recently established for ringplain 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. Nine sites have shown very strong improvements and a further six sites have shown strong improvement, most of which were of ecological significance. No statistically significant temporal deterioration in MCI scores has been found at any site. The majority of improved sites are in mid catchment, with few of the improved sites in the lower reaches of ringplain catchments.

Macroinvertebrate recolonisation project

Taranaki Regional Council have provided data (mainly macroinvertebrate data and aerial photography) to assist NIWA to research stream connectivity and invertebrate recolonisation in Taranaki with regard to riparian planting initiatives in the region.

Stream Habitat Assessment Protocol

The SEM Stream Habitat Assessment Protocol (SHAP) programme re-started this year, with 21 sites visited. The data will be evaluated approximately every 5 years and the results incorporated into other SEM programmes such as the riparian monitoring programme.

Testing improvements in water quality from riparian planting

The riparian management water quality monitoring programme consists of continual monitoring of four catchments in the Taranaki region. A report is in development for the Kaupokonui catchment to look at trends in parameters such as periphyton, macroinvertebrates, recreational bathing, temperature and SHAP in relation to riparian planting initiatives and agricultural discharge. The report currently collates data for the past 12

years. Taranaki Regional Council is aiming to focus on a final draft for peer review and to roll out similar reports for the three other major catchments based on the Kaupokonui template.

Regional Freshwater Plan

Taranaki Regional Council's Freshwater Plan and Regional Soil Plan are currently under review. This involves work on the production of discussion papers and technical investigations covering a variety of topics. A few key areas concerned are diffuse source contamination, including the riparian programme, freshwater biodiversity, including wetland protection and dual treatment systems for point source agricultural discharges, and of course limit setting as required by the NPS.

The Council has commenced its review of the Regional Freshwater Plan for Taranaki, which was made operative in 2001. The Council is currently in the process of preparing discussion documents for stakeholder consultation on complex and/or potentially contentious issues. The Council is also carrying out internal reviews of less contentious or complex issues. Issues for review include:

Contentious and or/complex issues

- Setting of water quality objectives and water quality limits
- Setting of water allocation objectives, environmental flows and levels (including allocation limits and minimum flows and levels)
- Efficient water allocation methods, including criteria for transfer of water allocation rights
- Management of farm dairy effluent and dual discharge systems (water and land) also including feedpads, race runoff, silage pits etc
- Riparian management, including stock access to water
- Protection of wetlands.

Issues for internal review

- Cumulative effects on water quality
- Analysing the relationship between ecological health indicators and chemical and physical drivers
- The efficiency of permitted activity standards for water abstractions, and discharges to land and water
- Stream modification rules
- Oil and gas activity rules
- Gravel extraction rules
- Review of the Fresh Water Plan's schedule of high value rivers
- Review of the contribution of Afforestation Grant Scheme and the STRESS programmes to soil conservation objectives

Hornwort discovered in Rotorangi

There was a discovery of hornwort in Lake Rotorangi when a macrophytes survey was undertaken this year. This development led to discussions around a potential SOE programme to be developed for monitoring and control measures of invasive macrophytes in Taranaki's lakes.

Hydraulic fracturing, or 'Fracking'

We are currently doing a lot of freshwater quality work (biomonitoring in particular) around the developments of hydrocarbon well sites and potential fracking in the Taranaki region.

Pātea Dam fish transfers

Contractors have conducted fish surveys in the upper Pātea and Waitara rivers to show impacts of the Pātea Dam (TrustPower Ltd) and fish transfer procedures. Inverts surveys have been performed in the lower river below the dam under minimum and variable flow conditions.

8.4.7 Tasman District Council

Trevor James (Resource Scientist) completed a 'State of the Environment' report on the Health of Freshwater Fish in Tasman District in late 2011 which follows on nicely from a report on river water quality completed 6 months earlier.

This Council has really got into high gear with remediation of fish passage barriers, fixing over 70 culverts and installing one fish-friendly tidegate (FFG) from December 2011-April 2012. This opened up about 90 km of waterway for our migratory fish species. This builds on the 50 km opened up in efforts over the previous 5 years. Most of these barriers are culverts on Council roads, but several are on private land. Concrete aprons have been installed on about 10 sites where inanga passage is required but we are moving more to using waste conveyor belt material and mussel spat ropes as these are much more cost effective and expedient. The material is very tough and expected to last well. Working with **Kelly Hughes** of Advanced Traffic Supplies has been very productive and rewarding. The on-going surveillance and remedial work for fish passage is yet to be internalised with the Engineering Department of Council.

Dr Mike Hickford of University of Canterbury helped Tasman District Council (TDC) staff get their eye in for finding inanga eggs. They discovered that when they got their search image on (with the aid of magnifying spectacles) and had the keys of where to look, they found them in the vast majority of surveyed streams. Staff believe that knowing where these spawning sites are will really help them manage this resource better. Previous surveys relied on witnessing spawning activity (milt and aggregations of gravid fish) but this seems less reliable and more onerous.

Trevor has also just finished a report on water quality of a sub-catchment of the Aorere, which is dominated by pākihi soils. This catchment has high phosphorus concentrations in the waterway (five times the guidelines at the lowest), as well as very high cover of filamentous green algae and E.coli. The Council is seeking advice for managing P loss in these types of soils and will be undertaking a snapshot of sampling of waterways in catchments dominated by this soil type.

Modelling by **Ben Knight** at Cawthron to predict real-time faecal indicator bacteria in the Motueka River plume has been successful for the river but not in the coastal waters. Model performance for the river was better than for other models used for live warnings overseas (eg PhillyRiverCast in the USA), with > 80% of predictions being a true positive and < 10% false positive. However, it did not work for the coastal environment partly because we did not have enough data for exceedence events. This means we will have to do some targeted high flow monitoring.

A risk assessment for all the region's estuaries and coastline has been completed with a view to integrating river and coastal issues where they are linked. Catchment sediment and nutrient loads form part of this project.



The photo shows a remediation job undertaken two years ago in the Aorere Catchment of Golden Bay. Large schools of inanga are now found upstream of this culvert whereas there were none previously. After two years this conveyor belt material is covered with bryophytes and looks natural.

Mary-Anne Baker (Policy Planner) has finally got most of the part of the Tasman Resource Management Plan dealing with works and structures in waterways ratified. Only two outstanding appeals remain. One part that has been contentious has been the inclusion of many specific values of specific reaches of waterways for recreation. RiVAS has been used for this process but the hearings panel wanted more verification and referencing about where the information came from and the authority of various members of the expert panels that were used. Hydro-electric power interests were particularly concerned about kayaking values being listed.

Plans by Council's engineering department to re-focus river protection work away from using crack willow toward other willow types and rock has met with protest and resistance from several quarters. The risk to increases in stream temperature from crack willow removal in larger waterways such as the Motueka River is high.

8.4.8 Horizons Regional Council

Staff changes

Carol Nicholson (Environmental Scientist, Aquatic) and **Kate McArthur** (Senior Scientist Water Quality) have both left, while **Toni Johnston** (Research Associate), **Michael Patterson** (Research Associate) and **Josh Markham** have joined the team.

70 bug sites

Sampling of macroinvertebrates has been undertaken at 70 sites throughout the region this year. Extra sites have been completed as part of collaborative research with Cawthron Institute under the cumulative stressors programme primarily funded by the former Ministry of Science and Innovation (now the Ministry of Business, Innovation and Employment).

Keeping the land on the land

The "Clean Water Productive Land" (CWPL) research programme (primarily funded by the former Ministry of Science and Innovation) is a multi-provider programme lead by AgResearch that aims to develop process understanding, models and mitigation tools to underpin improved management of pollution from agricultural land use. A major part of the programme is in partnership with Horizons Regional Council and involves a case study of sediment dynamics in the Manawatū Catchment, where sediment effects are a critical issue for land and water management. The case study, led by Landcare Research, has two components:

- data collection and analysis to provide information on critical source areas for sediment; and
- development of a catchment erosion and sediment Model (SedNetNZ) that contains a physical representation of all erosion processes, sediment storages, and transfers.

The first component of data collection has been undertaken by Horizons as a part of its sediment monitoring network and will be used to underpin model development.

Landcare Research has now completed a report for AgResearch and Horizons Regional Council. Entitled "Suspended sediment yields in the Manawatū Catchment: analysis of data collected by Horizons Regional Council", it is the first comprehensive analysis of the data holdings from Horizons continuous sediment data collection programme.

The report identifies that "The HRC suspended sediment data set for the Manawatū River provides one of the best records of total sediment yield and variation in yield within a large catchment available in New Zealand". The data set in the Manawatū Catchment includes six sites with between 6.5 and 10 years of data and a further two sites with a record of around four years of data. This dataset is a significant improvement on what was available for the development of previous models such as the Suspended Sediment Yield Estimator (SSYE) which was based on three sites with a very limited number of suspended sediment gaugings.

The report identified three of the biggest contributors to the sediment load in the Manawatū River at Palmerston North as the upper Manawatū at Hopelands site, the Pohangina and the Tiraumea sites. Both the Pohangina and Tiraumea sites are in priority catchments for SLUI, and this study further adds to the existing knowledge base that suggests the area upstream of Manawatū at Hopelands should be the next priority zone for SLUI in the Manawatū Catchment.

New Projects

A weekly research monitoring programme has been initiated looking at cyanobacteria coverage at nine sites within the Manawatū catchment and the potential reasons for the difference in coverage levels, ie instream nutrient levels, flow data etc.

An intensive monitoring programme has been undertaken in conjunction with Palmerston North City Council (PNCC) and Horizons to look into the effects of PNCC's sewage treatment plant discharge to the Manawatū River.

State of the Environment monitoring

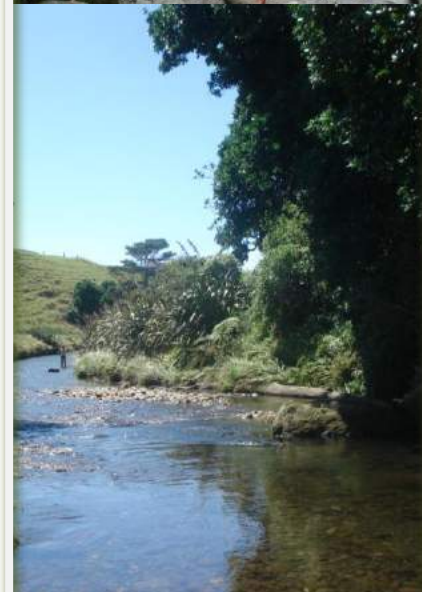
Horizons has been going through the process of merging all of our data from two databases (QUALARC and Hilltop) into a single archive (Hilltop). This process has allowed us to quality assure and add quality codes to our data and is part of an on-going quality management system process for the collection, storage and reporting of water quality data.

Manawatū River Accord

The success of the Fresh Water Clean Up Fund application for the Manawatū Catchment was announced in early March. Further work is being undertaken to refine the projects.

The One Plan

Decisions from the Environment Court on the landscape, biodiversity, land and Rule 13-1 topics were delivered on September 5 this year, with the remainder of the submissions on the Plan being resolved through mediation. Horticulture and irrigated sheep and beef were brought into the plan's nutrient management scheme, and the region's coastal lakes were reinstated into the nutrient management regime. Consequently, existing dairy, horticulture, irrigated sheep and beef, and cropping operations in priority catchments will now require a resource consent around their nutrient management. Conversions to dairy anywhere in the region will require a resource consent. The region's native vegetation remnants and wetlands were also protected, with effects on these now required to be avoided or mitigated.



Stream Habitat Assessment Protocol on the Katikara Stream (top - upstream site, bottom - downstream coastal site). Hydrology officer taking flow gaugings).



Top: Alex James, Amber Sinton and Shelley McMurtrie measuring a large anaesthetised longfin eel caught in the Avon River. Photo: EOS Ecology/Bronwyn Gay. Bottom: Nick Hempston collecting a ponar grab sample in the lower Avon River. Photo: EOS Ecology.

8.4.9 EOS Ecology

What's EOS been up to?

The last year that has been thankfully bereft of any further large earthquakes (no one bats an eyelid at anything under a 5.0 these days). The staff at EOS Ecology have continued with their applied research and consultancy work on urban and rural systems, and research on Campbell Island freshwater ecology. The field team continued with surveys in freshwater and estuary environs (even through the snow!), the laboratory has been processing lots of invertebrate samples from throughout the country, and our design team have been developing great science communication solutions for a range of clients. Below is a summary of just some of the projects EOS has been working on.

AQUATIC ECOLOGY

Waterway naturalisation monitoring

EOS recently completed an assessment of the ecological success of a major naturalisation project in Christchurch where a box-lined channel was 'naturalised'. A short reach of this drain was of particularly high ecological value because of the presence of bluegill bully (*Gobiomorphus hubbsi*), a declining species that is not typically found in small urban waterways. EOS Ecology not only undertook a pre- and post-naturalisation fish and invertebrate survey but also contributed to the design of the new channel morphology and oversaw the construction in 2007. There were no dramatic changes in the invertebrate or fish species present, which further supports the findings of international literature on the topic. This lack of a change can be attributed to the distance from flying adult insect colonist sources, the short length of time since the naturalisation occurred, and the fact that such works do not necessarily improve water quality. Bluegill bullies, did however, expand their range into a specially designed reach in the naturalised section. Unfortunately the 22 February 2011 earthquake damaged some of their preferred habitat, which will hopefully be repaired sometime soon. Download a copy of the report from

<http://www.eosecology.co.nz/Our-Projects/Restoration-Design-and-Monitoring.asp>

Crayfish Creek restoration

We have almost completed the restoration of a small

springfed tributary in Rangiora. Supporting a locally and potentially nationally important population of freshwater crayfish (*Paranephrops zealandicus*), we designed the newly aligned lower portion of the creek to reflect the habitat parameters we found to be most closely related to the high kōura numbers. The restoration programme is one of the few in New Zealand where the stormwater from the surrounding urbanised catchment is to be specifically excluded from the stream to protect its springfed habitat and locally unique invertebrate community. Once the channel construction is complete, we will undertake a four-week biota transfer strategy from the old alignment to the new. A barrier we designed specifically to prevent trout (a known predator of kōura) from accessing the upstream section while still allowing passage of native fish such as lamprey, eels, and bullies has also been installed. In a collaborative programme with the Department of Conservation we hope to undertake a field trial of the barrier to determine its effectiveness in excluding trout.

Review of drain cleaning

We undertook a literature review on the ecological and physicochemical impacts of mechanical and chemical macrophyte management in soft-bottomed waterways for the Waikato Regional Council. Drainage waterways are often the only remnant wetland habitat left in many landscapes, thus are home to many native freshwater species. This is especially the case in the Waikato, where there are concerns that some of the macrophyte management techniques used are potentially detrimental to native flora and fauna. Unsurprisingly, the greatest impact of mechanical control is the physical habitat disturbance and inadvertent removal of biota from the channel. The major assumed impacts of chemical control (direct toxicity and depressed oxygen concentrations), have been rarely documented in practice and most observed effects are more related to habitat changes (eg, death of macrophytes). A number of best practice documents (both international and New Zealand) have been produced but it is unknown if these are followed or even effective. Despite the prevalence of macrophyte control activities in New Zealand there has been minimal research into its ecological or physicochemical impacts and whether best practice methodologies have the desired effects. A copy of the report can be downloaded at

<http://www.eosecology.co.nz/Our-Projects/Applied-Research.asp>

Selwyn District's water race network

We have completed a survey of two stock water race schemes to identify sites of high ecological value to assist the Selwyn District

Council (SDC) in a strategic review of their water race assets. There is increasing pressure to close schemes as the conversion to dairy farming renders them unnecessary in the eyes of many landowners. Since their creation 100+ years ago, water race schemes have been colonised by native fauna and flora and are now



Left: Setting Gee minnow traps in a water race in the Selwyn region. Right: **Amber Sinton** and **Nick Hempston** surveying water races in the Selwyn region. Photos: EOS Ecology/Bronwyn Gay.

habitat for many native freshwater animals including some of conservation concern such as Canterbury mudfish (nationally critical) and freshwater mussels (declining). Our survey has resulted in the identification of a number of sites of high ecological value and subsequent identification of the water race sections that must be retained to ensure continuous water flow to those sites. An interactive GIS layer has been created that allows SDC staff to access the information so that ecological values can be included in any decisions on the future of the water race schemes. A copy of the report can be downloaded at <http://www.eosecology.co.nz/Our-Projects/Applied-Research.asp>

Canterbury earthquakes and the lower Avon River

EOS Ecology surveyed fish and aquatic invertebrates in the lower Avon River to assess the current state of the fauna some 10 months after the February 2011 earthquake. The majority of sediment and sewage inputs after the earthquakes occurred in the lower Avon River and it is reasonable to assume the greatest impacts on aquatic fauna occurred there. Despite the disturbance of the 22 February 2011 and subsequent earthquakes, we found a diverse macroinvertebrate and fish fauna (51 and 12 species respectively). The invertebrate community was dominated by snails, worms, midge larvae, and crustaceans, which are the most common invertebrates in waterways throughout Christchurch and many urbanised catchments elsewhere. The fish fauna was dominated by species that are typical of the lower, tidally influenced reaches of many New Zealand rivers, such as shortfin eel, common bully, giant bully, common smelt, and inanga. While we cannot know what ecological impact there was on the lower Avon River immediately following the Christchurch 2011 earthquakes, our current survey indicates that there has certainly been no lasting effect – with the possible exception of our most upstream study section, which had few fish and a lack of fish cover possibly caused by smothering of the bed with liquefaction sand.



Shelley McMurtrie releasing a large longfin eel caught in the Avon River. Photos: EOS Ecology/Bronwyn Gay.

The Avon-Heathcote Estuary/Ihutai

Since the September 2010 earthquake we have been monitoring the effects of the Canterbury shakes on the Avon-Heathcote Estuary/Ihutai, looking at implications on both the ecology of the estuary and potential risks to human health. Data from our yearly estuarine benthic surveys (taken annually in March-April) is helping to monitor the changes these major seismic events have had on this important system. Our quarterly monitoring of *E. coli* and norovirus in cockles around the estuary – already in place to compare concentrations before and after the city's treated wastewater discharge into the estuary was discontinued – has also been of use to look at the consequence of unprecedented quantities of raw sewage on shellfish quality following the 2011 earthquakes. Both *E coli* and norovirus concentrations at the two river mouth sites dramatically increased after

the February earthquake. The June earthquake did not elicit a similar increase, indicating that the disturbance prevented the shellfish from feeding, as collection was within a few days of the earthquake.

Campbell Island

Thanks to funding from TFBIS (www.biodiversity.govt.nz/land/nzbs/tfbis/tfbis), we have begun the sizeable task of building an identification key for the aquatic invertebrates of Campbell Island. The key will be developed as a Lucid key and will be available online on our Campbell Island Bicentennial Expedition web site (www.cambellisland.org.nz) and on the Lucid web site. It will be presented in a way that will make it useable to those new to invertebrate identification, as well as being a valuable resource for more experienced taxonomists. The key is due to be completed some time next year.

SCIENCE COMMUNICATION

Our Science Communication department have had enjoyable and challenging jobs in the studio of late. From high-level brand and marketing graphic design for Aqualinc to content simplification and information design for Environment Canterbury, to a guide book on the Avon-Heathcote Estuary/Ihutai—we've been helping communicate complex scientific ideas and research outcomes to those without a science background.

To reinforce how a small investment in the skills of a science communication professional can have a big impact on the project outcomes, we've gathered a selection of projects into a booklet. This helps illustrate our areas of expertise, and how we can add value to your research or commercial enterprise. A copy can be obtained by emailing bronwyn@eosecology.co.nz.

A guide book to the Avon-Heathcote Estuary

We're proud to announce that our guide book to the Avon-Heathcote Estuary/Ihutai has now been printed. The book is a labour of love by authors Shelley McMurtrie and Sonia Kennedy, as well as our design team who created a wonderfully crafted booklet filled with fantastic info-graphics. Designed to be taken with you as you

explore one of Christchurch's greatest treasures, this field guide will introduce you to the abundant wildlife, sites of historical interest, and favoured recreation spots of Te Ihutai. There is no better way to find out more about the sheltered waters of the Avon-Heathcote Estuary/Ihutai, which are not only home to countless birds and animals, but have also played a significant role in the lives of people for hundreds of years. The book was produced for the Avon-

Heathcote Estuary Ihutai

Trust and is available at local book stores in Christchurch or can be ordered via the Trust website

www.estuary.org.nz.





Right to left: **Nick Hempston** measuring water velocity; **Amber Sinton** surveying the river; **Amber Sinton** and **Nick Hempston** surveying; **Nick Hempston** collecting a kick-net sample – all in the Otukaikino River. Photos: EOS Ecology/Bronwyn Gay.

8.4.10 Ryder Consulting

Dean Olsen joined Ryder Consulting's Dunedin office at the end of 2011 and is enjoying being back in his hometown and revisiting some of his old haunts. Since arriving he has worked on a range of projects including several assessments for resource consent applications for hydroelectric power schemes and surveys associated with mining proposals.

2012 has seen **Ben Ludgate** complete many ecological assessments throughout the country. Ben has also been involved with assessing the efficacy of a fish trap at the base of the TrustPower Limited Pātea River dam, and assisting with the enhancement of the trap and transfer operation for climbing whitebait and elvers. This has included electric fishing, trapping and spotlighting surveys below the dam, as well as identifying whitebait specimens to determine which species are successfully reaching the fish trap.

Ben also manages Ryder Consulting's purpose built laboratory in Dunedin. Laboratory staff have a wide range of skills and expertise, and use high quality equipment to process macroinvertebrate, periphyton and phytoplankton samples from throughout the country. Clientele include regional, district, city, and unitary councils, private sector clients, and other consulting companies.

Jarred Arthur has been with the company for over a year now, since completing his MSc at the University of Canterbury. Jarred has become an integral member of the Dunedin office, and spends his time assisting other staff in the laboratory processing macroinvertebrate samples, as well as completing ecological assessments of wastewater and mining



Pātea Dam Native Fish Transfer Unit

discharges throughout Otago and Southland.

Greg Ryder has been assisting Environment Southland with its Waituna Lagoon investigations. He has also completed ecotoxicology studies in the Dunedin laboratory using *Deleatidium* mayflies sourced locally from drinking water catchments.

Ruth Goldsmith had an enjoyable field summer with frequent trips to the West Coast for monitoring associated with the TrustPower Limited Arnold River hydroelectric power scheme. The three years of baseline monitoring is now complete, however construction has been put on hold for the meantime. Reconsenting and monitoring associated with existing schemes continues to keep Ruth busy though. Sadly our Christchurch office was condemned to the 'Red Zone' in February so we will be looking for new premises early next year.



Close-up view of the oral sucker of a lamprey from the Arnold River.

8.4.11 The Catalyst Group - Palmerston North

Established in 2012, The Catalyst Group (TCG) is a resource management consultancy specialising in strategy and planning, ecology, and freshwater management. In their old lives

the TCG principals were the prime drivers of the Manawatu-Whanganui Region's One Plan. The Environment Court recently released its decision on the One Plan, and it is one we're very proud of. The One Plan introduces rules for the protection of wetlands and other rare/threatened habitat types, as well as regulating intensive agriculture to manage diffuse contaminant impacts on freshwater.

The Group consists of Directors **Greg Carlyon** and **Alistair Beveridge** with freshwater expertise provided by **Fleur Maseyk** (wetlands), **Glen Maclean** (fisheries) and **Kate McArthur** (water quality). The team are currently involved in advising water quality limits, preparing water conservation orders, supporting district councils to improve their performance and assisting clients in resource consent hearings, while also taking time to raise children, write PhDs, catch fish, speak up for the values they believe in and spend time in, on or around the watery bits of the central North Island.

8.4.12 Cawthron Institute

Roger Young has been involved in a variety of projects over the last year. The proposed Ruataniwha Water Storage project in Central Hawkes Bay has been an interesting one, with work completed on the effects of proposed scheme on habitat availability, fish passage and flow variability. Roger spent a cool and damp week in February measuring ecosystem metabolism throughout the Tukituki Catchment with **John Quinn**, **Kit Rutherford** and **Bob Wilcock** as part of the MBIE (formerly MSI) Aquatic Rehabilitation project. Roger enjoyed working with **Joanne Clapcott**, and the rest of the project team, on the Sediment Assessment Methods report that was completed late last year. Roger assisted **Kati Doehring** with measurements of ecosystem metabolism in a bunch of Waikato sites with different histories of riparian protection, again as part of the MBIE Aquatic Rehabilitation project.



“Colour-in our rivers”: Rhodamine release in 22 Waikato’s streams to assess differences in DO between fenced and unfenced stream reaches as part of the MBIE (formerly MSI) Aquatic Rehabilitation Project. Photo: Kati Doehring

It was also good to get fieldwork underway throughout the Horizons Region looking at patterns of stress response across 58 sites in ecosystem metabolism, cellulose decomposition and stable isotope ratios (with **Annika Wagenhoff**, **Joanne Clapcott**, and **Ada Pastor Oliveras**) and benthic cyanobacteria blooms and toxicity (with **Mark Heath**

and **Susie Wood**). This work is part of the MBIE (formerly MSI) Cumulative Effects programme and when combined with Horizons Regional Council’s measurements of water quality, periphyton and invertebrate communities, this dataset will provide a powerful picture of how a wide range of indicators respond to stress gradients that will be critical for limit setting. Roger has also been assisting Fish & Game with the Waiau/Hurunui River Regional Plan, Tasman District Council on a limit-setting plan, the Environmental Defense Society with the Canterbury Regional Policy Statement, Environment Southland with effects of water abstraction from spring-fed streams, and Greater Wellington Regional Council with a potential water storage project in the Wairarapa.

Susie Wood continues to work on cyanobacteria in lakes and rivers. With Waikato University collaborators she is developing molecular-based methods to characterise diversity and to understand toxin production. With **Ken Ryan** (Victoria University), she co-supervises **Mark Heath** (PhD) and **Katie Barsell** (MSc), whose research aims to understand variables influencing benthic cyanobacterial blooms in rivers, toxin production and their effect on ecosystem health (eg macroinvertebrate communities). Susie and **Jeannie Kuhajek** have developed a laboratory-based method to study didymo and have recently demonstrated that didymo cells can survive, divide and attach in river water with a wide range of chemical properties including water from North Island rivers and spring-fed creeks.

Rasmus Gabrielsson joined Cawthron in January 2012 after having spent the last four years working for Otago Fish & Game. Rasmus has been working part time on his PhD thesis, exploring fisheries monitoring using geochemical markers. Besides aiming to hand in his thesis in the next year Rasmus will also be working with **John Hayes** and **Roger Young** on fishery related projects. One of these projects include collaborating with Fish & Game staff around the country to investigate the extent of the link between trout decline and dairy intensification with the aim to better inform future management of cumulative effects on sports fisheries.



Kati Doehring installing temperature loggers in the upper Waiau River Catchment as part of the Amuri Integrated Hydro Project for Meridian Energy Ltd. Photo: Iain Maxwell

Kati Doehring has been writing AEEs for the Ruataniwha Water Storage Project (HBRC) and the Amuri Integrated Hydro Project for the Waiau River in Northern Canterbury (Meridian Energy). Kati has also finished the field work component of the MBIE (formerly MSI) Aquatic Rehabilitation Project in the Waikato Region. This particular part of the project looks at how dissolved oxygen concentrations change along and between a buffered, fenced-off stream reach and a non-buffered, unfenced reach. In one of her latest projects, she's been working closely with **Roger**

Young and regional councils to set-up an interactive online one-stop shop about the state of New Zealand's fresh water. This resource aims to educate the public about our freshwaters, in simple, non-scientific language, but with exciting new technology. Science communication in the 21st Century here we come!

Annika Wagenhoff graduated from Otago University last year and joined the Freshwater team at the Cawthron Institute in January 2012 where she continues to look into multiple-stressor effects from land use as well as ecological thresholds in streams and rivers in close collaboration with **Roger Young** and **Joanne Clapcott**. Having had little time to enjoy the new and sunny location, she soon headed up North for an extensive field survey in the Manawatū-Wanganui region at Horizons monitoring sites together with PhD student **Ada Pastor Oliveras** from the University of Barcelona.

Craig Allen continues to model habitat in New Zealand rivers to help ascertain ecologically relevant minimum flow requirements and assess the impact of proposed hydro schemes for various species. He has also been co-leading ecosystem assessment and restoration studies in the coastal environment south of Levin as part of an MBIE-funded programme – Manaaki Taha Moana – that aims to assist iwi to maintain and enhance their coastal ecosystems.

As well as the AEEs for the Ruataniwha Water Storage Project (HBRC) and the Amuri Integrated Hydro Project mentioned earlier, **Karen Shearer** has been involved in testing the flow-related, process-based model, BITHABSIM (Benthic Invertebrate Time series Habitat Simulation). Karen continues to play and coach field hockey with no signs of slowing up anytime soon.



An optical sensor measuring dissolved oxygen to determine rates of stream metabolism (left) and a cotton strip deployed on the stream bed to determine cellulose decomposition potential in streams (right). Photo: Annika Wagenhoff



Cawthron Institute's freshwater team has been conducting field work during summer 2011/12 in the Waiau River just south of Hanmer Springs as part of the Amuri Integrated Hydro Project for Meridian Energy Ltd. Photo: Craig Allen

John Hayes has had a hectic year juggling several large consulting jobs related to flow allocation and water conservation orders with MBIE research. He had two research highlights. The first project involved revising and applying a process-based drift and net rate of energy intake modelling package to determine the flow requirements of brown trout in the Matura River (the models are now available on the Cawthron web site <http://www.cawthron.org.nz/coastal-freshwater-resources/modelling-brown-trout-growth.html>). The second project involved testing another flow related, process-based model, BITHABSIM (Benthic Invertebrate Time series Habitat Simulation), against a *Deleatidium* abundance time series from the Rainy River, in the Motueka catchment. Both of these projects were rewarding as they are pushing the frontier of applied ecohydrology and involved a wider team of very capable, committed, and fun staff, including **Karen Shearer, Eric Goodwin, Joe Hay and Craig Allen.**

Dave Kelly (formerly from DoC) has joined the Cawthron Coastal and Freshwater team in March 2012, and will add to the group's expertise in the areas of lake ecology, benthic ecology, and native fisheries. Dave is working on a combination of projects on water quality and ecological condition of lakes, and will be working with **John Hayes** looking at invertebrate productivity and drift in relation to flow management. Dave has spent a good deal of time since his arrival on environment court cases on the Mōkihinui River Hydro Proposal and Horizons' One Plan.

8.4.13 Morphum Environmental Ltd

The last year has seen Morphum expanding in all directions – we've added a new fuel efficient Suzuki Jimny to our carbon-conscious fleet, gained several fantastic members of staff, started to work on projects overseas and even jumped the notorious ditch with our new branch opening in Melbourne.

Morphum have been working in collaboration with staff from URS, Pattle Delamore Partners and AECOM to develop catchment management plans for some of Auckland's trickier urban catchments. Environmental Scientist **Justine Coup** and Environmental Engineer **Damian Young** have taken up the challenge with their backgrounds in Watercourse Management Plans, ecological surveying and community collaboration. The aim of this is to integrate receiving environment values into stormwater planning.

Director **Caleb Clarke** and Justine have been working to provide enhancement opportunities for some of Auckland's urban streams as part and parcel of capital works being undertaken around the central city. Not only are we hoping to improve these areas ecologically, but we are trying our best to make them useful spaces for the wider community, whilst not exacerbating flooding.

Morphum have been getting lots of practice at finding wastewater cross-connections and leaks in our ageing stormwater networks. Thankfully, these leaks are being fixed which means less wastewater discharging into the freshwater and marine environment – a real gain for public and ecological health.



Rob Holmes and Karen Shearer of Cawthron work with NMIT aquaculture students using multi-pass depletion electric fishing methods in the Rainy River. Juvenile trout are counted as part of a long-term trout biomass study to link juvenile trout density and biomass with flow and temperature Photo: Jo Thompson



Stormwater pond near a new subdivision in a development hotspot, Westgate, Auckland.

As one of the Auckland Mayor Len Brown's '100 Projects', Director **Damian Young** has been investigating the daylighting of some of Auckland's hidden, urban streams. Some of these projects look set to go ahead which will be a huge bonus for banded kokopu, long finned eels and invertebrates that dwell within our urban streams.

Scientist **Katherine Read** and Environmental Engineer **Matthew Hall** have recently completed post-installation monitoring of soft-engineering devices used for bank stabilisation in streams. The results show that methods such as geo-textile linings, living walls, Newbury Rock Riffle structures and scour stop matting are beneficial. This supports the use of soft-engineering options rather than 'hard-' traditional methods for bank and channel stabilisation works.

There are hundreds of constructed ponds and wetlands across the Auckland Region which are used for stormwater treatment and management. Several of Morphem's Environmental Engineers have been undertaking pond surveys assessing their function and design, sediment and vegetation, structure condition, health and safety compliance, and overall aesthetics and quality. Based on these factors a multi-criteria analysis framework has been developed to define priorities for maintenance activities.

On the advocacy front, Morphem are continuing to support community groups and schools to become kaitiaki and to help improve the quality of their streams through the Wai Care (Auckland Central) programme. Four team members travelled to Wellington to present several papers at the WaterNZ Stormwater Conference in May and Justine flew to Samoa in May to undertake an Environmental Impact Assessment for the proposed sewage network upgrade in Apia. Add that to the various monitoring, AEE works and report writing we are completing and - Wow! Is it nearly Christmas?

Last but not least, we are very proud to say we are now a carboNZero^{Cert™} certified organisation – well done to our sustainability team! To find out more about how we mitigate our greenhouse gas emissions check out this article

<http://morphum.com/news.asp?pageID=2145880545&RefID=2141741863>.



Kath Read undertaking stormwater sampling to isolate wastewater discharges on a very brisk morning. Photo: Taryn Pearce

8.4.14 Stark Environmental Ltd

In the last year **John** and **Yvonne Stark** and the staff at Stark Environmental have processed over 730 macroinvertebrate samples for 15 different clients from throughout New Zealand and have prepared 15 client reports and two briefs of evidence. Major projects have included the freshwater ecological aspects of Buller Coal Ltd's proposed Escarpment Mine Project, and Fonterra's Whareroa Dairy Factory re-consenting.

8.4.15 Golder Associates

Ian Boothroyd, Nick Carter Richard Allibone, Duncan Gray, Katherine Muchna, Annabel Barnden and Anna Wilkes are all involved in freshwater activities at Golder, based in Auckland, Christchurch and Dunedin.

Ian Boothroyd continues to lead the Ecology (including freshwater, terrestrial and marine ecologists) Team at Golder Associates. Ian is actively involved in a variety of environmental impact assessments for a range of proposed developments including energy generation (windfarms, geothermal and hydro-electric generation), mining and land developments. Although progress is sometimes slow, Ian continues his research on the taxonomy and ecology of Chironomidae. The past year has seen Ian further develop his key to the New Zealand chironomid larval fauna, as well as continuing to collect and prepare descriptions of new species from around New Zealand. The focus of Ian's work has been the subfamily Orthocladiinae but Ian continues to consider some of the more problematic chironomid genera such as *Polypedilum* and the Tanypodinae. New species continue to emerge (no pun intended) and Ian is eagerly planning to describe these in the near future. He also continues his research into the ecology and functioning of geothermal ecosystems, and has recently been investigating contaminant flows and resilience within geothermal ecosystems. Ian continues his collaborative project work on the ecology of geothermal ecosystems with the University of Iceland. Ian is an accredited independent commissioner and sits on hearings that are involved with making decisions on applications for resource consents.

Richard Allibone is based within our Dunedin office. Richard has been involved in a number of native fish projects working in all parts of the country. Two major projects have been investigations for amendments to Water Conservation Orders – one on the Rakaia River for the Lake Coleridge project and the Kawarau WCO amendment that seeks to prevent damming of the Nevis River. He also worked on native fish evidence for DoC for the now withdrawn Mōkihinui hydro electric dam Environment Court case. Richard has also been writing fishing methods for DoC and undertaking analysis of threatened fish data monitoring data. Additional smaller projects included consent monitoring and assessment of effects for new mining projects. Richard, together with **Duncan Gray, Annabel Barnden** and **Katherine Muchna** also recently completed a number of projects at the Stockton plateau and in the Ngākawau River catchment.

Duncan Gray is primarily involved in environmental flow reviews for the Canterbury regional council and is part of a multi-disciplinary team working on landuse scenario implications for water quantity and quality in the lowland streams of the Selwyn/Te Waihora catchment. Duncan has also been involved in ecological assessments of streams draining mine impacted landscapes. In particular, a repeat fish survey of the Ngākawau River on the West Coast of the South Island for Solid Energy has revealed dramatic improvements in kōaro recruitment over a 5 year period. Aside from consulting work, Duncan has maintained his interest in research, publishing papers on braided river ecology, Acid Mine Drainage, and continuing his collaboration with Harvard University on the phylogeographics of the groundwater flat worm *Prorhynchus putealis*.

Nick Carter is based in our Auckland office and assists with a variety of project work around the country. Nick is involved in algal, habitat, invertebrate and fishery surveys. In particular Nick is involved in new and existing mining developments, assessments of effects of hydro-electric developments, assessments for

residual flows, treated wastewater discharges and water abstractions. Nick is also frequently asked to assess the permanence (cf. intermittent nature) of waterways in the Auckland region. Nick has been involved in assessing waterways in Fiji for a potential gold mine development.

Katherine Muchna has completed her MSc at the University of Auckland. Her thesis topic was on introduced skinks, which means that Katherine is now multi-skilled in freshwater and terrestrial environments. Over the past year, Katherine's freshwater work has focussed on ecological surveys and fish health assessments for existing and proposed mining developments throughout the country. Within Auckland, Katherine is involved in assessments of the permanence of waterways in the Auckland region and effects assessments within the freshwater environment.

Annabel Barnden is based in our Christchurch office and is actively involved in a variety of projects throughout the South Island, undertaking algal, habitat, macroinvertebrate and fishery assessments. More recently, Annabel has been especially involved in projects in the mining sector which has included both routine resource consent biomonitoring and investigations and assessments of waterways in areas of prospective mine expansion.

Anna Wilkes is also based in our Christchurch office where she is the office manager. Quite apart from Anna's involvement in re-establishing the office following the February 2011 earthquake, Anna is involved in a number of stormwater management and compliance monitoring projects. She is working with Christchurch City Council to prepare a Stormwater Management Plan and associated consent documentation for the Styx River catchment, to the north of Christchurch. Anna also managed the consenting process for the South-West Christchurch Stormwater Management Plan, which was recently granted. Anna manages consent monitoring and annual reporting for a range of clients and projects including the lake at Pegasus town, construction effects and stormwater treatment efficiency monitoring in residential developments and municipal wastewater treatment plants.

8.4.16 Tonkin & Taylor Ltd

Tonkin & Taylor's Environmental Biology team has working on projects for mines, state highways, water supply, irrigation and hydropower schemes, and conducting ongoing environmental monitoring for consent compliance. **Brett Ogilvie** continues to lead the team, which has ten staff with aquatic and terrestrial expertise (and he's always looking for more good people ...)

We have been involved in the implementation of the Waterview Connection motorway project in Auckland with Brett taking on the ecology team leader role. **Liza Inglis, Caleb Sjardin, Sara Howarth, Dean Miller, Katherine de Silva** (on contract) and **Kieran Miller** have been assisting with the development of management plans, and the implementation of the environmental monitoring programme associated with the works is now underway.

Continuing the roading theme, **Matt Baber, Graham Ussher, Dean, Sara** and **Caleb** have been working on ecological investigations for NZTA to support the SH1 Waikato Expressway: Huntly Section regulatory approvals. The project has involved comprehensive surveys of stream, lake, wetland and terrestrial ecological resources along the proposed route and the development of mitigation options to achieve no-net-loss of local



Liza Inglis collecting stream cross section data in the Mahurangi River. Photo: Caleb Sjardin

biodiversity values. Graham has also been heavily involved in developing biodiversity offset guidelines and models for DoC and a number of private sector clients.

Liza and **Peter Roan** (who now also leads Tonkin & Taylor's Resource Management team) have been involved in applying for consents for the Warkworth Water Supply Scheme for Watercare, which has required extensive stream surveys and WAIORA modelling (working with **Ian Jowett**) in the Mahurangi River catchment to assess effects and developing mitigation options.

The team have continued their ongoing monitoring of residual flows for a number of water supply dams and hydro lakes. Over the past two years Liza, Dean and Caleb have been carrying out routine environmental monitoring for the Tongariro Power Scheme located in the central North Island. This has involved monthly excursions to the central volcanic plateau to carry out periphyton and macroinvertebrate monitoring at a range of sites.

In Hamilton, Dean is continuing to work with the Mangakōtukutuku Stream Care Group (MSCG) on stream restoration projects in south Hamilton. Tonkin & Taylor and MSCG were recently awarded Waikato River Cleanup Trust funding to develop demonstration sites for urban stream restoration at several locations on the stream. The project will address stream bank erosion using a mix of hard and soft materials, more ecologically-sensitive techniques, and will incorporate specific habitat features for native fish.

We have continued to undertake Stream Ecological Valuation assessments in the Auckland Region and beyond, and Brett and Liza participated in the SEV review process for the Auckland (Regional) Council. Brett, Matt and Graham have been involved in Council, Environment Court and Board of Inquiry hearings relating to the Mt William North mine on the West Coast, Wellington's Transmission Gully motorway and Auckland's Onehunga Foreshore project, as well as commercial developments. Brett also became a certified Hearing Commissioner in 2011 (as well as finally completing his Environmental Economics degree after several years of Massey extramural study – nice to have few evenings that can be used for other purposes!). Brett continues to assist **Ian Hogg** and **David Hamilton** by presenting post-graduate seminars at Waikato University.

On the International front, we are finishing up our inputs on the Bujagali hydropower project in Uganda (after 14 years!), as that project is coming to commissioning, and have been involved in assessing effects of chromite mining proposals at several riverine and estuarine sites in New Caledonia. We are about to commence work on a 360 MW hydropower project in the Tanzanian highlands, which is seeking finance from

the World Bank Group, and therefore must meet World Bank Group environmental performance standards. Issues there include IUCN Red List species, and assessment and management of effects on a Ramsar wetland downstream of the site, and requirements for biodiversity offsets. Tonkin & Taylor's **David Leong** will be providing hydrology inputs to this project.



Caleb Sjardin collecting a surber sample from the Tongariro River. Photo: Liza Inglis

8.4.17 Aquanet Consulting Ltd

The Ruataniwha Water Storage Project team delivered their full feasibility report to the Hawke's Bay Regional Council in September. **Olivier Ausseil** is the Science Leader for this project, which involves the project management, coordination and review of a number of land-use, water quality, water quantity and ecological studies.

Olivier Ausseil has completed a regional state of knowledge on the effects of stormwater report for Hawke's Bay regional Council and a regional nutrient status report for Greater Wellington Regional Council, and is finalising a series of technical reports on recommended water quality limits to support Greater Wellington's proposed Freshwater Plan.

Olivier, in association with **Keith Hamill** of Opus is also undertaking a critical review of Environment Bay of Plenty's freshwater monitoring programme. Olivier facilitated a community workshop at the Tuahuru Marae (Mahia), and he and **Fiona Death** are now developing a Catchment Management Plan (CMP) for the Whangawehi Stream (Mahia Peninsula) on behalf of the tangata whenua of Mahia, landowners of the Whangawehi catchment, the Hawke's Bay Regional Council and the Wairoa District Council. Olivier is also continuing with his role as the Palmerston North Wastewater Monitoring Group facilitator.

Aquanet was commissioned to undertake a number of field studies, and over the 2011-12 season **Fiona Death** undertook a summer-long monitoring study of periphyton, macroinvertebrates and deposited sediments in the Turitea Stream, upstream and downstream of the Palmerston North's water supply reservoirs and water treatment plant (see photograph 1). We also completed the annual periphyton and macroinvertebrate survey of the Whangawehi Stream catchment, Mahia Peninsula.

With regards to RMA processes, **Fiona Death** and **Jeff Cooke** undertake compliance assessments of a large number of resource consents on behalf of Horizons. Olivier was involved in a number of Environment Court and regional council hearings, including the One Plan water quality court hearing, the New Zealand Defence Force Waiouru wastewater treatment plant hearings (as a Hearing Commissioner) and the Carterton wastewater treatment plant hearing. We also developed a Pollution Index for Hawke's Bay Regional Council for the setting of resource consent monitoring charges under S36 of the RMA.



Dye (fluorescein) testing: an easy way to check travel times and lateral mixing. Turitea Stream, downstream of the point of backwash water discharge from Palmerston North's potable water treatment plant. Photo: Olivier Ausseil.

8.5 Iwi organisations

Te Ao Marama Incorporated (Murihiku/Southland):

Te Ao Marama Incorporated represents the four Ngāi Tahu Papatipu Rūnanga in Murihiku/Southland on resource management matters. These four Papatipu Rūnanga are:

- Te Rūnaka o Waihōpai
- Te Rūnanga o Awarua
- Te Rūnanga o Oraka Aparima and
- Te Rūnanga o Hokonui.



The team at Te Ao Marama Incorporated consists of **Michael Skerrett** (Kaupapa Taiao Manager), **Dean Whaanga** (Māori Resource Management Officer), **Max Sutton** (Administration Officer) and **Dr Jane Kitson** (Kaimātai Pūtaiao/'scientist').

In waimāori (freshwater) our work in the past year has included involvement in projects with Environment Southland, such as the Southland Water 2010: Report on the State of Southland's Freshwater Environment, the Waituna Lagoon Response work, and various policy and planning areas including the Water and Land 2020 project.

Dean helped compile the Murihiku Whenua Ora Profile with Kāi Tahu Ki Otago Limited (KTKO Ltd) and Public Health South (PHS). This work identified that water quality and quantity, and disaster preparedness were seen as key issues for the health and well-being of whānau in the Southland region.

Jane has written up her work examining cultural monitoring tools to understand population trends of kanakana (lamprey) on the Waikawa River, and the cultural impacts of *Aeromonas salmonicida* (the bacterium associated with mortalities of kanakana in Murihiku in 2011). This year's projects include determining the cultural health of Waituna Lagoon and Catchment, and examining the cultural values of groundwater, and scoping a cultural monitoring programme based on the Murihiku iwi management plan.⁴



Kanakana (lamprey) at 'Top falls', Waikawa River. Photo: S. Ledington

⁴ Ngāi Tahu ki Murihiku. (2008). *Te Tangi a Tauria: The cry of the People. Ngāi Tahu ki Murihiku Natural Resource and Environmental Iwi Management Plan*. Invercargill.

Ngati Rangi Trust

Hannah Rainforth left the Department of Conservation in February to take up a role as a poutoko taiao (environmental manager) with Ngāti Rangi Trust in Ohākune. Her most exciting project is a study of the temporal and spatial pH dynamics of the Whangaehu River and how this relates to flow and input from Te Wai-a-Moe ('Crater Lake'), which has an acidity of around 0.9.

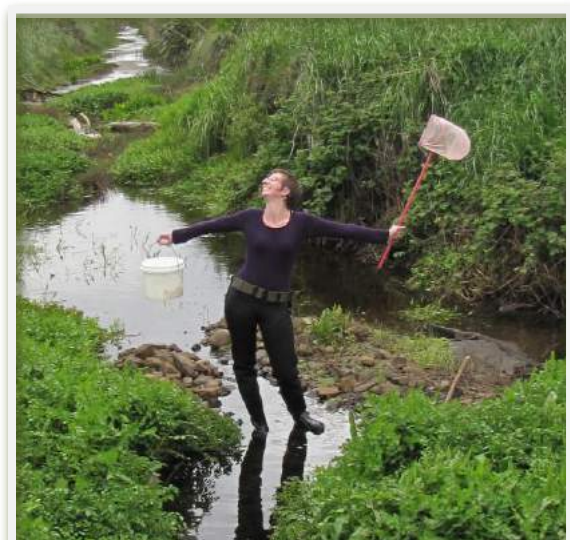
Hannah has also been planning and undertaking fish, kākahi and kōura surveys in areas where traditional fishing occurred, and working on a Cultural Health Index for Ngāti Rangi. The projects have been somewhat on hold while Hannah participated in the Land and Water Forum for Whanganui iwi but she is looking forward to getting back into them. In between this, Hannah has been working with contractor **Hollei Gabrielson** to develop iwi resource management plans, pairing up with Horizons Regional Council to train iwi members on how to assess culverts for fish passage, and keeping up with the usual RMA work involved in iwi affairs.

8.5.1 Others

John McIntosh is continuing to work as an environmental consultant in the Bay of Plenty with principal clients being the Bay of Plenty Regional Council and the Rotorua District Council. The work area relates to the remediation of the Rotorua/Te Arawa lakes.

The Travelling Fish Geek

Stella McQueen's big project for the year is writing the next freshwater fish fieldguide, in collaboration with wildlife photographer Rod Morris, as part of the popular 'A Photographic Guide' series by publishers New Holland. To better research this project, she has become a mobile fish geek living in her campervan and adventuring the length of the country to meet fish and other fish geeks. It is over a year since she kicked off a Manawatū whitebait habitat restoration project, when a conversation over coffee led to bringing the plight of whitebait to the Manawatū speaking circuit and proved so popular that she had to turn down requests for further talks. This resulted in the creation of a self-driving community group focused on restoration of local inanga spawning habitat, with external technical support from Stella, Horizons, DoC and others. Also in the last year(ish) Stella saw the completion of her first two large public native aquarium projects, at the National Trout Centre in Tūrangi and Te Manawa in Palmerston North. Both are fantastic must-see attractions, even if she does say so herself.



Stella McQueen



9 Recent Publications

Ausseil, O. 2011. Effects of urban and industrial stormwater discharges in the Hawke's Bay Region. State of knowledge report. Report prepared for Hawke's Bay Regional Council by Aquanet Consulting Ltd.

Ausseil, O. 2011. Nutrient status of rivers and streams in the Wellington region. An analysis of state of the environment monitoring data. Report prepared for Greater Wellington Regional Council by Aquanet Consulting Ltd.

Ballantine, D.J. and Tanner, C.C. 2010. Substrate and filter materials to enhance phosphorus removal in constructed wetlands treating diffuse farm runoff: A review. *New Zealand Journal of Agricultural Research* 53: 71-95.

Bierschenk, A.M., Savage, C., Townsend, C.R. & Matthaei, C.D. (2012) Intensity of land use in the catchment influences river ecosystem functioning along a freshwater-to-marine continuum. *Ecosystems* 15: 637–651.

Blair, J. M. and Hicks, B. J. 2012. Otolith microchemistry of koi carp in the Waikato region, New Zealand: a tool for identifying recruitment locations? *Inland Waters* 2: 109-118. doi: 10.5268/IW-

Bowie, S., Ravenscroft, P. and Nelson, D. 2010. Lowland longjaw galaxias management plan. Unpublished DoC report. Christchurch

Broady, P.A., Flint, E.A., Nelson, W.A., Cassie Cooper, V., de Winton, M.D. and Novis, P. 2012. Phyla CHLOROPHYTA and CHROMOPHYTA. Chapter 23, 347-384 in: Godon, D (Ed.): *New Zealand Inventory of Biodiversity Volume 3: Kingdoms Bacteria, Protozoa, Chromista, Plantae, Fungi*. Christchurch. Canterbury University Press. 616 [+16] p.

Brogt, E, Sampson, K. A., Comer, K., Turnbull, M. H. and McIntosh, A. R. 2011. Using institutional research data on tertiary performance to inform departmental advice to secondary students. *Journal of Institutional Research* 16: 26-41.

Burns, C.W., Brett, M.T., and Schallenberg, M. 2011. A comparison of the trophic transfer of fatty acids in freshwater plankton by cladocerans and calanoid copepods. *Freshwater Biology* 56: 889–903.

Carey, C.C., Ibelings, B.W., Hoffmann, E.P., Hamilton, D.P. and Brookes, J.D. 2012. Eco-physiological adaptations that favour freshwater cyanobacteria in a changing climate. *Water Research* 46: 1394–1407.

Carraro, E., Guyennon, N., Hamilton, D., Valsecchi, L., Manfredi, E.C., Viviano, G., Salerno, F., Tartari, G. and Copetti, D. 2012. Coupling high-resolution measurements to a three-dimensional lake model to assess the spatial and temporal dynamics of the cyanobacterium *Planktothrix rubescens* in a medium-sized lake. *Hydrobiologia* DOI: 10.1007/s10750-012-1096-y.

Clapcott J.E., Young R.G., Harding J.S., Matthaei C.D., Quinn J.M., Death R.G. 2011. Sediment Assessment Methods: Protocols and guidelines for assessing the effects of deposited fine sediment on in-stream values. Cawthron Institute, Nelson, New Zealand.

Clapcott, J.E., Collier, K.J., Death, R.G., Goodwin, E.O., Harding, J.S., Kelly, D., Leathwick, J.R., and Young, R.G. 2012. Quantifying relationships between land-use gradients and structural and functional indicators of stream ecological integrity. *Freshwater Biology* 57: 74-90.

Clearwater, S.C., Jellyman, P.G., Biggs, B.J.F., Hickey, C.W., Blair, N. & Clayton, J.S. 2011. Pulse dose application of chelated copper to a river for *Didymosphenia geminata* control: effects on macroinvertebrates and fish. *Environmental Toxicology and Chemistry* 30: 181-195.

Collier, K.J. 2011. The rapid rise of streams and rivers in conservation assessment. *Aquatic Conservation: Marine and Freshwater Ecosystems* 21:397–400.

Collier, K.J., Demetras, N., Duggan, I.C., and Johnston, T.M. 2011. Wild record of an apple snail in the Waikato River, Hamilton, New Zealand, and their incidence in freshwater aquaria. *New Zealand Natural Sciences* 36: 1-9.

Collier, K.J., Clapcott, J.E., David, B.O., Death, R.G., Kelly, D., Leathwick, J.L., and Young, R.G. 2012. Macroinvertebrate-pressure relationships in boatable New Zealand rivers: influence of underlying environment and sampling substrate. *River Research and Applications*. DOI: 10.1002/rra.2564

David, B.O., and Hamer, M.P. 2012. Remediation of a perched stream culvert with ropes improves fish passage. *Marine and Freshwater Research* 63:440-449.

Doehring K, Young RG, McIntosh AR 2012. Facilitation of upstream passage for juveniles of a weakly-swimming migratory galaxiid. *New Zealand Journal of Marine & Freshwater Research*, DOI:10.1080/00288330.2011.639787.

Didham, R.K., Blakely, T.J., Ewers, R.M., Hitchings, T.R., Ward, J.B. and Winterbourn, M.J. 2012. Horizontal and vertical structuring in the dispersal of adult aquatic insects in a fragmented landscape. *Fundamental and Applied Limnology* 180: 27-40.

Duggan, I.C. 2012. Urban planning provides potential for lake restoration through catchment re-vegetation. *Urban Forestry & Urban Greening* 11: 95-99.

Duggan, I.C. and Duggan, K.S. 2011. Are botanical gardens a risk for zooplankton invasions? *Biological Invasions* 13: 2997-3003.

Duggan, I.C. and Eastwood, K.R. 2012. Detection and distribution of *Craspedacusta sowerbii*: Observations of medusa are not enough. *Aquatic Invasions* 7: 271-275.

Duggan, I.C., Robinson K.V., Burns, C.W., Banks, J.C. and Hogg, I.D. *in press*. Identifying invertebrate invasions using morphological and molecular analyses: North American *Daphnia 'pulex'* in New Zealand fresh waters. *Aquatic Invasions*.

Effenberger M., Gerth M., Diehl S. & Matthaei C.D. (2011) Experimental bed disturbance and fish exclusion influence the distribution of stream invertebrates and algae. *Journal of Animal Ecology* 80: 603-614.

Environment Southland and Te Ao Marama Incorporated 2011. Our Ecosystems: How healthy is the life in our water and our freshwater ecosystems? Part 2 of Southland Water 2010: Report on the State of Southland's Freshwater Environment. Invercargill: Environment Southland. www.es.govt.nz.

Environment Southland and Te Ao Marama Incorporated 2011. Our Threats: How safe are we from floods, droughts and other extreme climate events? Part 4 of Southland Water 2010: Report on the State of Southland's Freshwater Environment. Invercargill: Environment Southland. www.es.govt.nz.

Environment Southland and Te Ao Marama Incorporated 2011. Our Uses: How do we use our water and is there enough for our different needs? Part 3 of Southland Water 2010: Report on the State of Southland's Freshwater Environment. Invercargill: Environment Southland. www.es.govt.nz.

Gabrielsson, R., Kim, J., Reid, M., Stirling, C., Numata, M. and Closs, G. *in press*. Does the trace element composition of brown trout (*Salmo trutta*) eggs remain unchanged in spawning redds? *Journal of Fish Biology*.

Górski, K., de Leeuw, J.J., Winter, H.V., Vekhov, D.A., Minin, A.E., Buijse, A.D., and Nagelkerke, L.A.J. 2011. Fish recruitment in a large, temperate floodplain: the importance of annual flooding, temperature and habitat complexity. *Freshwater Biology* 56: 2210–2225.

Górski, K., Van den Bosch, L.V., Van de Wolfshaar, K.E., Middelkoop, H., Nagelkerke, L.A.J., Filippov, O.V., Zolotarev, D.V., Yakovlev, S.V., Minin, A.E., Winter, H.V., De Leeuw, J.J., Buijse, A.D. and

Verreth, J.A.J. 2011. Post-damming flow regime development in a large lowland river (Volga, Russian Federation): implications for floodplain inundation and fisheries. *River Research and Applications* DOI: 10.1002/rra.1499

Gray, D.P. and Harding, J.S. *in press*. Acid Mine Drainage Index (AMDI): a benthic invertebrate biotic index for assessing coal mining impacts in New Zealand streams. *New Zealand Journal of Marine and Freshwater Research*.

Greenwood, M.J., Harding, J.S., Niyogi, D. K. and McIntosh, A. R. 2012. Improving the effectiveness of riparian management for aquatic invertebrates in degraded agricultural landscapes: stream size and land-use legacies. *Journal of Applied Ecology*, 49:213-222

Greig, H.S.*, Kratina, P.*, Thompson, P.L., Palen, W.J., Richardson, J.S. and Shurin, J.B. 2012. Warming, eutrophication and predator loss amplify subsidies between aquatic and terrestrial ecosystems. *Global Change Biology* 18: 504-514. * authors contributed equally.

Greer, M.J.C., Closs, G.P., Crow, S.K., and Hicks, A.S. *in press*. Complete versus partial macrophyte removal: The impacts of two drain management strategies on freshwater fish in lowland New Zealand streams. *Ecology of Freshwater Fish*.

Harper, M.A, Van Eaton, A. 2011. High flying diatoms: widely dispersed microfossils from a New Zealand supereruption. Poster, Geosciences 2011 Conference, Nelson, New Zealand, abstracts p.45, Geosciences Society of New Zealand, Miscellaneous publications 130A: 45

Headley, T.R.; Tanner, C.C. 2012. Innovations in stormwater treatment using constructed wetlands with floating emergent macrophytes. *Critical Reviews in Environmental Science and Technology* DOI: 10.1080/10643389.2011.574108 (in press).

Herrmann P.B., Townsend C.R. & Matthaehi C.D. (in press) Individual and combined effects of fish predation and bed disturbance on stream benthic communities: a streamside channel experiment. *Freshwater Biology*.

Hoellein, T. J., Bruesewitz, D. A. and Hamilton, D. P. 2012. Are geothermal streams important sites of nutrient uptake in an agricultural and urbanising landscape (Rotorua, New Zealand)? *Freshwater Biology* 57: 116–128.

Hogsden, K.L. and Harding, J.S. 2012. Anthropogenic and natural sources of acidity and metals and their influence on the structure of stream food webs. *Environmental Pollution* 162: 466–472.

Hogsden, K.L. and Harding, J.S. 2012. Consequences of acid mine drainage for the structure and function of benthic stream communities: a review. *Freshwater Science* (formerly *Journal of the North American Benthological Society*) 31: 108–120.

Hughes, A.O., Quinn, J.M., Lucy A. McKergow, L.A. *in press*. Suspended sediment yields and event sediment dynamics from two headwater catchments with contrasting land uses as determined from long-term turbidity monitoring, Waikato, New Zealand. *New Zealand Journal of Marine and Freshwater*.

Jellyman, P.G. & Harding, J.S. *in press*. The role of dams in altering freshwater fish communities in New Zealand. *New Zealand Journal of Marine and Freshwater Research*.

Jellyman, P.G., Clearwater, S.C., Clayton, J.S., Kilroy, C., Blair, N., Hickey, C.W. & Biggs, B.J.F. 2011. Controlling the invasive alga *Didymosphenia geminata*: an ecotoxicity assessment of four potential biocides. *Archives of Environmental Contamination and Toxicology* 61: 115-127.

Jenkins, K.M., Kingsford, R.T., Closs, G.P., Wolfenden, B.J., Matthaehi, C.D., and Hay, S.E. 2011. Climate change and freshwater ecosystems in Oceania: An assessment of vulnerability and adaptation opportunities. *Pacific Conservation Biology* 17:201-219.

Kai Tahu ki Otago Ltd, Te Ao Marama Inc and Public Health South 2011. Murihiku Whenua Ora Profile. Environmental Health Profile for Otago and Southland.

Kara, E.L., Hanson, P., Hamilton, D., Hipsey, M.R., McMahon, K.D., Read, J.S., Winslow, L., Dedrick, J., Rose, K., Carey, C.C., Bertilsson, S., da Motta Marques, D., Beversdorf, L., Miller, T., Wu, C., Hsieh, Y.-F., Gaiser, E., Kratz, T. 2012. Time-scale dependence in numerical simulations: Assessment of physical, chemical, and biological predictions in a stratified lake at temporal scales of hours to months. *Environmental Modelling & Software* 35: 104-121.

Kitson, J. 2012. Cultural Impact Assessment of *Aeromonas salmonicida* in Murihiku. Report prepared for Ministry for Primary Industries.

Kitson, J., Leith, V., Whaanga, D., Hay, J., Quarterman, A., Ledington, S and C. Pauling 2012. Kanakana Harvest Matauranga: Potential tools to monitor population trends on the Waikawa River, Southland/Murihiku (A Scoping Project). Final Technical Report for Ngā Pae o Te Māramatanga, Te Ao Marama Incorporated.

Klemmer, A.J., Wissinger, S.A., Greig, H.S. and Ostrofsky, M.L. 2012. Non-linear effects of consumer density on multiple ecosystem processes. *Journal of Animal Ecology*. doi: 10.1111/j.1365-2656.2012.01966.x

Kratina, P.*, Greig, H.S.*, Thompson, P.L., Carvalho-Pereira, T.S.A. and Shurin, J.B. 2012. Warming modifies trophic cascades and eutrophication in experimental freshwater communities. *Ecology* 93: 1421-1430. *authors contributed equally.

Kristensen, E.A., Closs, G.P., Olley, R., Kim, J., Reid, M., and Stirling, C. 2011. Determining the spatial distribution of spawning by anadromous and resident brown trout *Salmo trutta* L using strontium content of eggs collected from redds. *Ecology of Freshwater Fish* 20:377-383.

Lange K., Liess A., Piggott J.J., Townsend C.R. & Matthaei C.D. (2011) Light, nutrients and grazing interact to determine stream diatom community composition and functional group structure. *Freshwater Biology* 56: 264-278.

Lear, G., Ancion, P.-Y., Harding, J.S. and Lewis, G.D. *in press*. Use of bacterial communities to assess the ecological health of a recently restored stream. *New Zealand Journal of Marine and Freshwater Research*.

Liess, A., Le Gros, A., Wagenhoff, A., Townsend, C.R. & Matthaei, C.D. 2012. Landuse intensity in stream catchments affects the benthic food web: consequences for nutrient supply, periphyton C:nutrient ratios, and invertebrate richness and abundance. *Freshwater Science*, 31, 813-824.

Liess A., LeGros A., Wagenhoff A., Townsend C.R. & Matthaei C.D. (2012) Anthropogenic nutrient enrichment in streams: consequences for periphyton nutrient content and invertebrate community composition. *Freshwater Science*, in press (published online 10 July 2012).

Lill, A.W.T., Closs, G.P., Savage, C. and Schallenberg, M. 2012. Annual secondary production of two estuarine mysid species (Mysidacea: Mysidae) inhabiting an intermittently closed estuary, south-eastern New Zealand. *Marine and Freshwater Research* 63:823-834.

Lill, A.W.T., Closs, G.P., Schallenberg, M., and Savage, C. 2012. Impact of Berm Breaching on Hyperbenthic Macroinvertebrate Communities in Intermittently Closed Estuaries. *Estuaries and Coasts* 35:155-168.

Matheson, F.E.; Quinn, J.M.; Martin, M.L. *in press*. Irradiance effects on diel and seasonal patterns of nutrient uptake by stream periphyton. *Freshwater Biology*

McHugh, P. A., McIntosh, A. R., Howard, S. and Budy, P. *in press*. Niche flexibility and trout-galaxiid co-occurrence in a hydrologically diverse riverine landscape. *Biological Invasions*.

Moilanen, A.; Leathwick, J.R.; Quinn, J.M. 2011. Spatial prioritization of conservation management. *Conservation Letters* 4: 381-393.

O'Brien, J.M., Hamilton, S.K., Kinsman, L.E., Lennon, J.T. and Ostrom, N. 2012. Nitrogen transformations in a through-flow wetland using whole ecosystem pulsed ¹⁵N additions. *Limnology and Oceanography* 57: 221–234.

O'Brien J.M., Hamilton, S.K., Podzikowski, L. and Ostrom, N. 2012. The fate of assimilated N in stream biofilms: an in-situ benthic chamber study. *Freshwater Biology* 57: 1113–1125.

O'Brien, L.K. 2012: Canterbury mudfish fry survey spring 2011. Report to Department of Conservation. 10 p + figures.

Özkundakci, D. and D. P. Hamilton, 2012. Temporal coherence of water quality in mesocosms in a stratified eutrophic lake. *Journal of the Environment* 8(1): 37-46.

Parkes, S.M. and Duggan, I.C. *in press*. Are zooplankton invasions in constructed waters facilitated by simple communities? *Diversity & Distributions*.

Pearson, L.K. , Hendy, C.H., Hamilton, D.P., and Silvester, W.B., 2012. Nitrogen-15 isotope enrichment in benthic boundary layer gases of a stratified eutrophic iron and manganese rich lake. *Aquatic Geochemistry* 18: 1-19.

Pingram, M.A., Collier, K.J., Hamilton, D.P., David, B.O. and Hicks, B.J. *in press*. Carbon sources supporting large river food webs: a review of ecological theories and evidence from stable isotopes, *Freshwater Reviews*.

Reid D.J., Hewitt J.E., Scarsbrook M.R., Thrush S.F., van Houte-Howes K.S.S., Lohrer, A.M., Wright-Stow A.E., Chiaroni L.D., Matthaei C.D., Smith B.J., Townsend C.R. & Phillips N.R. (2011) Comparison of sedimentation impacts on the benthos of streams and estuaries using simultaneous field experiments. *Marine and Freshwater Research* 62: 1201-1213.

Roygard, J.K.F., McArthur, K.J., & Clark, M.E. 2012. Diffuse contributions dominate over point sources of soluble nutrients in two sub-catchments of the Manawatū River, New Zealand, *New Zealand Journal of Marine and Freshwater Research*, DOI:10.1080/00288330.2011.632425.

Shurin, J. B., Clasen, J.L., Greig, H.S., Kratina, P. and Thompson, P.L. *in press*. Warming shifts top-down and bottom-up control of pond food web structure and function. *Philosophical Transactions of the Royal Society B-Biological Sciences*.

Stott, R., Davies-Colley, R., Nagels, J., Donnison, A., Ross, C. and Muirhead, R. 2011. Differential behaviour of *Escherichia coli* and *Campylobacter* spp. in a stream draining dairy pasture. *Journal of Water and Health*. 09.1. pp59-69.

Tanner, C.C., Sukias, J.P.S., Headley, T.R., Yates, C.R., Stott, R. 2012. Constructed wetland and denitrifying bioreactors for on-site and decentralised wastewater treatment: Comparison of five alternative configurations. *Ecological Engineering* 42: 112-123.

Tanner, C.C.; Headley, T.R. 2011. Components of floating emergent macrophyte treatment wetlands influencing removal of stormwater pollutants. *Ecological Engineering*. 37: 474-486.

Tanner, C.C., Headley, T.R., Dakers A. 2011. Guideline for the use of horizontal subsurface-flow constructed wetlands in on-site treatment of household wastewaters. NIWA Client Report HAM2011-065 for Gisborne District Council. June 2011. 35 p.

Tanner, C.C., Sukias, J.P.S. 2011. Multi-year nutrient removal performance of three constructed wetlands intercepting drainage flows from grazed pastures. *Journal of Environmental Quality* 40: 620-633.

Tanner, C.C., Sukias, J.P.S., Yates, C. 2010. New Zealand guidelines for constructed wetland treatment of tile drainage. NIWA Information Series No. 75, Hamilton NZ. <http://www.niwa.co.nz/our-science/freshwater/tools/tile-drain-wetland-guidelines>

Taylor, C.M. and Duggan I.C. 2012. Can biotic resistance be utilized to reduce establishment rates of non-indigenous species in constructed waters? *Biological Invasions* 14: 307-322.

Umar, D., Marinov, M., Schorr, M. and Chapman, H. 2012. Odonata attracted by light - a new topic for myth-busters. International Dragonfly Fund - Report 43: 1-52.

Vanderpham, J.P., Nakagawa, S., and Closs, G.P. 2012. Diel variation in use of cover and feeding activity of a benthic freshwater fish in response to olfactory cues of a diurnal predator. *Environmental Biology of Fishes* 93:547-556.

Verburg, P., Antenucci, J.P. and Hecky, R.E. 2011. Differential cooling drives large-scale convective circulation in Lake Tanganyika. *Limnol. Oceanogr.* 56: 910–926.

Wagenhoff, A., Townsend, C.R., and Matthaei, C.D. 2012. Macroinvertebrate responses along broad stressor gradients of deposited fine sediment and dissolved nutrients: a stream mesocosm experiment. *Journal of Applied Ecology* 49, 892-902.

Wang, S., Qian, X., Han, B.-P., Luo, L., Hamilton, D. P. 2012. Effects of local climate and hydrological conditions on the thermal regime of a reservoir at Tropic of Cancer, in southern China. *Water Research* 46 2591–2604.

Winterbourn, M.J. *in press*. Nymphal life history and growth of *Atalophlebioides cromwelli* (Ephemeroptera: Leptophlebiidae) in the Selwyn River (South Island, New Zealand) and the effect of a very large flood. *New Zealand Natural Sciences* 37.

Wirriman, D., Eagar, S. H., Harper, M. A., Leroy, É., Sémah, A-M. 2011. First insights into mid-Holocene environmental change in central Vanuatu inferred from a terrestrial record from Emaotofer Swamp, Efate Island. *Quaternary Science Reviews* 30: 3908-3924.

Wood, S.A., Dietrich, D.R., Cary, S.C. and Hamilton, D.P. Increasing *Microcystis* cell density enhances microcystin synthesis: a mesocosm study. *Inland Waters* 2: 17-22.

Woodford, D. J., McIntosh, A. R. *in press*. Effects of introduced trout predation on non-diadromous galaxiid fish populations across invaded riverscapes. Science for Conservation. Department of Conservation, Wellington.

Woodford, D. J., Cochrane, T. A., McHugh, P. A. and McIntosh, A. R., 2011. Modelling spatial exclusion of a vulnerable native fish by introduced trout in rivers using landscape features: a new tool for conservation management. *Aquatic Conservation: Marine and Freshwater Ecosystems* 21: 484–493.

THESES

Phillip G. Jellyman. 2011. Disentangling the effects of disturbance and size on stream community structure. PhD, University of Canterbury, Christchurch.

Rebecca E. Campbell. 2011. Spatial pattern and community assembly : does the configuration of stream networks influence their community structure? PhD, University of Canterbury, Christchurch.

Teresa K. Burrell. 2011. Trophic State in Canterbury Waterways. MSc, University of Canterbury, Christchurch.

Laura R. Drummond. 2011. Influence of habitat drying on New Zealand stream macroinvertebrates. MSc, University of Canterbury, Christchurch.

Annika Wagenhoff. 2011. Multiple-stressor effects along gradients of deposited fine sediment and dissolved nutrients in streams. PhD thesis, University of Otago.

BOOKS AND BOOK CHAPTERS

Hamilton, D.P., McBride, C., Özkundakci, D., Schallenberg, M., Verburg, P., de Winton, M., Kelly, D., Hendy, C., Ye, W. 2012. Effects of climate change on New Zealand lakes. In: C.R. Goldman, M. Kumagai and R.D. Robarts (Eds.), *Effects of Climate Change and Variability on Inland Water Systems of the World: what can be done to reduce negative impacts*. Wiley Blackwell, UK.

Harper, M.A., Cassie-Cooper, V., Chang, F.H., Nelson, W.A. and Broady, P. A. 2012. Phylum Ochrophyta. Chapter 10. Brown and Golden-brown algae, Diatoms, Silicoflagellates, and kin. p. 114-163 in *New Zealand Inventory of Biodiversity, Volume 3: Kingdoms Bacteria, Protozoa, Chromista, Plantae, Fungi*. ed. D.Gordon, Christchurch, Canterbury University Press. 616 [+16] p.

McBride, G.; Ross, T.; Dufour, A. *in press*. Comparative Risk Analysis. Chapter 10 in Bartram, J., Bos, R. and Dufour, A. (eds). *Animal waste, water quality and human health*. Geneva: World Health Organization; London: International Water Association Publishers

McIntosh, A. R., McHugh, P. and Budy, P. 2012. Chapter 24, *Salmo trutta* L. (Brown Trout). Pp 287-299 in Francis, R. A. (Editor), *A Handbook of Global Freshwater Invasive Species*. Earthscan, London.

Oliver, R., Hamilton, D.P., Brookes, J. and Ganf, G.G., *in press*. Physiology, blooms and prediction of planktonic cyanobacteria. In: *Ecology of Cyanobacteria II: Their Diversity in Space and Time*. Whitton, B. A. (Ed.). Springer.



10 S.I.L 1987 Trust Fund Awards

Objective: To enable outstanding young scientists to attend overseas conferences, seminars or workshops, or to visit institutions to learn techniques, develop expertise, use equipment, collections or library facilities not available in New Zealand.

Eligibility: Applicants shall be New Zealand based members of the New Zealand Freshwater Sciences Society. Preference will be given to candidates less than 35 years of age, or who graduated in the previous 10 year period.

Previous awards: No person shall be ineligible for an award because of a previous award.

Applications: Applications shall be made on the electronic form available either on the website (<http://freshwater.rsnz.org>) or from the Secretary of the New Zealand Freshwater Sciences Society (b.sorrell@niwa.co.nz) by the date shown below.

Applicants will need to state their aims and objectives, submit a draft itinerary, supporting letters from relevant institutions, overseas contacts, a curriculum vitae, a list of publications, a draft budget showing other sources of financial support obtained or being sought, and name two referees.

Criteria: Applicants will be judged on the benefits that are likely to accrue to the candidate and limnological research in New Zealand as a result of the trip.

Reporting: The successful candidate will submit a trip report for publication in the Society's newsletter. Where appropriate, the successful candidate will also describe the work done during the trip at the next annual meeting of the Society.

Award: The award will cover the costs of travel (up to 100% for the grantee only) together with a contribution towards accommodation and living expenses up to \$2000.00 or such higher sum that may be determined by the Trustees.

Tenure: Such period/periods as the Committee thinks fit.

Frequency: The award may be made annually provided there are suitable candidates. The Committee may decide not to make an award in any particular year.

Closing date: Applications must be submitted to the Secretary/Treasurer by 30 November in any year for travel the following year. All material (including letters of support from referees) must be submitted electronically as pdfs or Word documents to the Secretary/Treasurer. Material received only as hard copy cannot be considered.



11 S.I.L. 1987 Trust Fund Guest Lecturer Award

Objective: To provide financial support for visits to and/or within New Zealand by eminent overseas limnologists, whose visits will benefit New Zealand's limnological research community as a whole.

Eligibility: Candidates should be eminent in some field of limnological research and have the ability to make a contribution to limnological research in New Zealand.

Previous awards: No person shall be ineligible for an award because of a previous award.

Applications: Applications shall be made on the electronic form available either on the website (<http://freshwater.rsnz.org>) or from the Secretary of the New Zealand Freshwater Sciences Society (b.sorrell@niwa.co.nz) by the date shown below.

Nominations: Candidates must be nominated by a financial member of the NZFSS who will submit on their behalf a letter outlining the aims and objectives of the trip, a curriculum vitae, a list of publications, a draft itinerary, a draft budget showing other sources of finance if any, and the names of two referees.

Criteria: The candidates shall be judged on their eminence in the field of limnological research and their ability to make a contribution to New Zealand's limnological research community. Visitors will be expected to address the annual meeting of the NZFSS and to visit several New Zealand research institutions including universities.

Reporting: The successful candidate will submit a trip report for publication in the Society's newsletter.

Award: The award will cover the costs of travel (up to 100% for the grantee only) together with a contribution towards accommodation and living expenses up to \$2000.00 or such higher sum that may be determined by the Trustees. In determining the value of the award the Committee shall take into account the fact that overseas scientists are often better able to receive financial assistance than New Zealanders.

Tenure: Such period/periods as the Committee thinks fit.

Frequency: The award may be made annually provided there are suitable candidates. The Committee may decide not to make an award in any particular year.

Closing date: Applications must be submitted to the Secretary/Treasurer by 30 November in any year for Guest Lecturers proposed for the following year's conference. All material (including letters of support from referees) must be submitted electronically to the Secretary/Treasurer as pdfs or Word documents. Material received only as hard copy cannot be considered.



12 S.I.L. stories from S.I.L. recipients who ventured abroad

Francis Burdon

Earlier this year (May 20 – 24), I was fortunate to attend the Annual Meeting of the Society for Freshwater Science in Louisville, Kentucky, with financial support from the SIL Trust. The meeting's theme was "Freshwater stewardship: challenges and solutions" and had several notable plenary talks. David Hart from the University of Maine gave an insightful presentation on the value of adaptive management in ensuring sustainability is a cornerstone of freshwater science, and Richard Kingsford from the University of New South Wales presented a significant talk discussing the role of media in affecting the ability of scientists to effectively communicate their work to the public. John Downing from Iowa State University discussed the all-too familiar problems associated with agricultural land uses and their effects on freshwater habitats in a North American mid-west context.

I gave my talk on the Monday, presenting research from my PhD thesis investigating the effects of sediment deposition on invertebrate communities in agricultural streams. The work I presented outlined findings from a field assay testing the effects of sediment deposition on litter breakdown and associated invertebrates, and a series of laboratory experiments teasing apart potential mechanisms for patterns elucidated from the field. In giving this presentation, I participated in a special session on the effects of disturbance and stressors on cross-habitat interactions. Whilst most of the talks involved the transfer of pollutants from one habitat to another by animal movement (eg, spawning salmon, emerging aquatic insects), I was able to provide a novel angle demonstrating how environmental context may not only affect the magnitude of inputs (ie detritus), but also their availability to recipient consumers and ecosystems (ie detrital breakdown and food-web linkages). This provided a useful example to help illustrate the conceptual model proposed by Dave Walters, a senior research scientist from US Geological Survey, and one of the session organizers, essentially stating that there is a duality in stressors driving exposure to the environment, but conversely also the environment affecting exposure to the stressor.

The meeting was typical of a Society for Freshwater Science (SFS) conference, with a wide array of talks from a range of North American and international delegates. I attended a notable talk given by Mark Gessner from IGB Berlin discussing the effects that multiple global change drivers have on detrital breakdown. Another interesting talk was given by David Lytle from Oregon State University demonstrating the potential for a predictive model describing stream invertebrate abundances using physical drivers only. In the poster session, some researchers from Auburn University including Jack Feminella outlined work describing the microbial communities of leaf litter affected by sediment burial using techniques including PCR, something particularly relevant to the research I presented.

No conference is complete without some social activities, and the organizers did a great job of ensuring the conference attendees were not disappointed by the opportunities to be had in Louisville. We were treated to a boat cruise on the Ohio River, and a trip to the slugger park, where we were able to eat hot-dogs, play a friendly game of baseball, and try out the uniquely southern activity of 'corn-holing'. We were also able to find some quality craft beer at the Bluegrass Brewing Company, where a Kiwi brewmaster was making an excellent range including a smooth Belgian Ale.

With the next SFS meeting in Jacksonville, Florida, it is likely that there will be only a few attendees from our part of the world at this conference. However, the SIL Trust is to be lauded for the support they offer Kiwi researchers in overcoming the tyranny of location and enabling us to attend these important meetings. I

can only but offer my profuse gratitude to the trust for the generous support they provided in enabling me to travel to this useful and informative conference.

Cynthia Winkworth

Earlier this year I was awarded a S.I.L. 1987 Trust Fund Travel Award to attend the 14th International Symposium on Microbial Ecology in Copenhagen, Denmark, in August. I presented some of my latest Postdoctoral research about the influence of different anthropogenic pressures on the presence of antibiotic resistance in freshwater biofilms and the associated risks for public health. As my research employs a combination of experimental and survey based approaches to investigate land-use impacts on freshwater ecosystems from antibiotic use in both agricultural and public health sectors, the biennial symposium offered an excellent opportunity to engage with internationally renowned scientists in the field of environmental microbial ecology. The weeklong conference was a chance to work towards establishing high-calibre, multi-disciplinary international research collaborations, as well to as gain valuable insight into the experimental techniques employed by established international researchers. I am particularly excited about the opportunity awarded to me by the New Zealand Freshwater Sciences Society to further develop my career. Attending the symposium goes towards ensuring my future research continues to benefit New Zealand by addressing pertinent national and international freshwater issues resulting from anthropogenic pressures.

13 V.H. Jolly Student Travel Awards

NZFSS encourages student attendance at its conferences by supporting student travel through the V.H. Jolly Awards. The Awards are named in honour of the late Violet Hilary Jolly, a founder member of the Society and one of New Zealand's foremost pioneering limnologists, who was instrumental in encouraging and supporting student involvement in New Zealand limnology.

The criteria for the Awards are as follows:

1. The Awards are solely for the purpose of supporting the travel expenses of students attending the annual conference of NZFSS.
2. The Awards are restricted to full-time students who are financial members of the NZFSS, as defined in the Society constitution.
3. Only those students who present either an oral paper or a poster paper at the conference for which an Award is sought are eligible.
4. Students who are residents of the town where the conference is being held are not eligible.
5. Students who are in receipt of other forms of travel support to attend the conference are not eligible.
6. Students may apply for an Award in person by identifying themselves to the Secretary/Treasurer during the conference.
7. The sum awarded shall be up to \$100.00 per student, and the funds available for Awards shall be half of the interest earned in the previous financial year on the Society's bank accounts.
8. In the event of the number of applications exceeding the available funds, the Secretary/Treasurer shall distribute the available Awards on the basis of the distance travelled to the conference.



14 NZ Freshwater Sciences Society Medal and Honorary Membership

Rules:

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.

15 Budget for the year ended 30 June 2011

Schedule 1

NZ Limnological Society (Inc.) t/a NZ Freshwater Sciences Society

Financial Performance Schedule
for the year ended 30 June 2011

	<i>This Year</i>	<i>Last Year</i>
	\$	\$
Cash Expenses		
Awards		
DoC Prizes	650	150
VH Jolly Memorial Fund	800	1,000
SIL Trust Prize	1,500	800
Fish & Game Prize	<u>250</u>	<u>250</u>
	3,200	2,200
Bank Charges	578	560
Conference 2010 - Seeding Fund	-	5,000
Conference Expenses	-	975
Donations	10,000	-
Emblems	21	-
Postage	241	458
Printing Costs		
Newaletter	797	2,656
Subscriptions	631	631
Website Design	<u>-</u>	<u>578</u>
	<u>15,468</u>	<u>13,058</u>
Interest Received		
Bank of New Zealand Ltd	<u>2,896</u>	<u>2,427</u>
Sundry Income		
Subscriptions	8,854	4,392
Conference Income	417	4,110
Donations Received	-	553
SIL Trust Donations	183	86
Entomological Society Bulletin	<u>306</u>	<u>-</u>
	<u>9,760</u>	<u>9,141</u>

NZ Limnological Society (Inc.) t/a NZ Freshwater Sciences Society

**Statement of Financial Performance
for the year ended 30 June 2011**

	<i>Sch</i>	<i>This Year</i> \$	<i>Last Year</i> \$
Income			
Book Sales		755	657
Cost of Sales			
Opening Stock		950	1,964
Closing Stock		<u>919</u>	<u>950</u>
		31	1,014
Gross Profit			
		<u>724</u>	<u>(357)</u>
Interest Received	1	2,896	2,427
Sundry Income	1	<u>9,760</u>	<u>9,141</u>
		13,380	11,211
Expenses			
Cash Expenses	1	15,468	13,058
Net Income /Loss for Year			
		<u>(2,088)</u>	<u>(1,847)</u>
Income Reserved			
		(2,088)	(1,847)
		<u>(2,088)</u>	<u>(1,847)</u>

NZ Limnological Society (Inc.) t/a NZ Freshwater Sciences Society

**Statement of Movements in Members Funds
for the year ended 30 June 2011**

		<i>This Year</i> \$	<i>Last Year</i> \$
Debits for Year:			
Deficit of Income over Expenses for Year		2,088	1,847
Adjustment for 2009 Income Overstated		<u>-</u>	<u>3,672</u>
		2,088	5,519
Debit for Year			
		<u>(2,088)</u>	<u>(5,519)</u>
Opening Credit Balance		83,189	88,709
Closing Credit Balance			
		<u>81,101</u>	<u>83,189</u>

NZ Limnological Society (Inc.) t/a, NZ Freshwater Sciences Society

**Statement of Financial Position
as at 30 June 2011**

	<i>This Year</i>	<i>Last Year</i>
	\$	\$
ASSETS		
Current Assets		
Bank of New Zealand Ltd	20,508	9,600
GST Refund	142	341
Interest Accrued	227	1,399
Stock on Hand	919	950
	<u>21,796</u>	<u>12,290</u>
Investments		
Bank of New Zealand Ltd		
Term Deposit due 30/07/10 @ 4.80%	64,941	70,913
	<u>64,941</u>	<u>70,913</u>
Total Assets	<u>86,737</u>	<u>83,203</u>
LIABILITIES		
Current Liabilities		
Accounts Payable	5,625	13
Subscriptions in Advance	10	-
	<u>5,635</u>	<u>13</u>
Total Liabilities	<u>5,635</u>	<u>13</u>
EXCESS ASSETS OVER LIABILITIES	<u>81,102</u>	<u>83,190</u>
EQUITY		
Members Funds	81,102	83,190
	<u>81,102</u>	<u>83,190</u>

Approved by Trustees

16 Minutes of the 44th Annual General Meeting of the New Zealand Limnological Society Inc.

(Trading as New Zealand Freshwater Sciences Society)

The AGM was held at the Brisbane Convention Centre, Queensland on Wednesday 28th September, 2011. The meeting opened at 4:35 pm.

Present: David Hamilton, President; Janine Wech, Assistant Secretary-Treasurer; and 34 members.

1. **Apologies:** Kevin Collier, Brian Sorrell, Susie Wood, Hannah Rainforth, Jane Kitson, Kristy Hogsden, Jon Harding, Kit Rutherford, Caroline Burns, Gerry Closs, and Vivienne Cassie-Cooper.
2. **Minutes of the 43rd AGM:** Review of elected and co-opted members
 - Officers elected to the executive:
 - David Hamilton – President
 - Brian Sorrell – Secretary-Treasurer
 - Susie Woods – Committee Officer
 - Deniz Özkundakci - Committee Officer
 - Hannah Rainforth – Newsletter Editor
 - Mary de Winton – S.I.L Trust Fund Awards Committee Officer
 - Natasha Grainger – S.I.L Trust Fund Awards Committee Officer
 - Co-opted members:
 - Janine Wech – Assistant Secretary/Treasurer
 - Kati Doerhing – Assistant Newsletter Editor
 - Jay Piggott – Website Manager
 - Kristy Hogsden – Student Representative
 - Mike Patrick – Media Monitor
 - Jane Kitson – Maori Representative
 - Justine Coop – Community Outreach

Matters arising from minutes: Dealt with under general business.

Motion: That the minutes be accepted as a true and correct record of the 43rd AGM (*David Hamilton / Neil Deans – carried*)

3. **President's Report:**

People may be somewhat confused about what has really happened to improve freshwater management at the national level over the past year; they may not be alone. The Land and Water Forum had successfully brought together water stakeholders from a diverse range of organisations and put together set of recommendations on freshwater management for NZ. We then waited for a National Policy Statement (NPS) in Freshwater Management that would set bottom-line environmental standards that had to be met, in line with the recommendations from the Land and Water Forum. Unfortunately the National Policy Statement was substantially weakened and a number of the recommendations made by the Land and Water Forum were removed. NZFSS made a media statement following the release of the NPS. At the time of our AGM, NZFSS is about to endorse a recommendation for an environmental reporting bill which would provide for regular, independent 'State of the Environment' reporting. This bill will hopefully address New Zealand's recent poor record in this area relative to other OECD countries. The OECD has already identified New Zealand as one of a small number of countries where there is declining water quality – this was one of a large number of talks given at an International Water Association conference on Diffuse Pollution and Eutrophication (also combined with the IWA Health-Related Water Microbiology Specialist Group), which was held in Rotorua – and successfully organised by several members of NZFSS. Collectively, these issues highlight that a science-based approach to freshwater management must be strengthened to support the current demands on water quantity and to address the issue of declining water quality, particularly with a targeted freshwater restoration fund. It is also clear that there is a need to directly address the issue of diffuse pollution, including both nutrient and microbial contaminants.

It has been interesting to observe the way that lack of funding has cut into attendances of members at two important conferences. The first is our annual conference, which in 2011 is a combined one with the Australian Society for Limnology. The poor exchange rate of the NZ dollar and the exorbitant cost of registration and accommodation hit our attendance badly, despite the goodwill of our Australian colleagues in providing concessions with registration. Once again we have to thank the vision of our SIL Trustees with their investment arising from the 1987 conference, which has allowed for support of 10 students at the annual conference in Brisbane. Another conference, independent of NZFSS, was the second Freshwater Management Forum, held in Wellington earlier in 2011. At the request of the organisers Clive Howard-Williams presented an excellent paper on scientific support for freshwater management and used the opportunity to endorse NZFSS. The very substantial registration costs for this conference appeared to have deterred NZFSS members despite relatively good attendances by many water stakeholders.

I note the passing of two members of NZFSS over the past year. Dr David Le Cren died on 8th September 2011. He spent his working life in the UK where he became Chief Scientist of the Freshwater Biological Association, before retiring to New Zealand. He attended a number of NZFSS and SIL congresses, even in recent years, and the prestigious Le Cren medal in the UK was recently won by a New Zealander for the first time, when it was awarded posthumously to Bob McDowall earlier this year. Unfortunately Bob too, passed away in February this year. Bob's name is synonymous with native fishes of New Zealand and Australia. At the Brisbane conference Don Jellyman gave a wonderful documentation of Bob's life and left us in awe of his prolific scientific output. The intention is to put up a copy of Don Jellyman's presentation on the NZFSS web site.

On a positive note, I would like to thank several people who have contributed to NZFSS in the past year. Jay Piggott made a seamless transition as web site coordinator and has kept members well informed through email. Kati Doehring has eased some of the substantial burden on Hannah Rainforth relating to the

preparation of our newsletter – well done to both for their efforts. A quick glimpse at the upcoming newsletter indicates that it is 128 pages in length. I would also like to thank Kevin Collier for his timely and reliable advice to me and Jon Harding for his representation on the Royal Society Biological Sciences Advisory Panel. Amongst our executive I wish to acknowledge our Māori representative, Jane Kitson, in a role that will surely become increasingly prominent with recent and upcoming co-management and settlement agreements.

Thanks to Brian Sorrell who continues to do an excellent job as Treasurer despite (or maybe because of) the tyrannies of distance and to Janine Wech for her timely and valuable contributions as Secretary. I also acknowledge the auditor for NZFSS, Stephen Dine, of Brown Web Richardson of Hastings.

One area in which we have not made a lot of progress on is the Code of Conduct for NZFSS. When we joined the Royal Society as a constituent Society we appear to be bound by its Code of Ethics. As a society we may need to formally adopt the Royal Society’s code. I will follow this aspect through in the following year and confer with other people who may be more knowledgeable than me in this regard.

We will soon see the much-awaited publication of the Crustacea book. Mike Winterbourn in particular has done a great job in tying together with text and at the present time it is my understanding that only some figures require sorting before it does to publication.

Next year’s conference is in Dunedin from 3rd to 7th December, followed by Hamilton in winter 2013, in a combined conference with NZ Marine Sciences Society and the Australasian Society for Phycology and Aquatic Botany.

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

4. Secretary-Treasurer’s Report:

Total membership at 1 September 2011 was 438, with an increase in waged members in 2011 and stable student numbers (Tables 1 and 2). Due to the early AGM this year (September rather than November), audited financial accounts are unavailable so preliminary unaudited figures are presented here. The audited Secretary/Treasurer report will be posted out for formal approval with subscription renewal notices for 2012. 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 Bulletin and Freshwaters books) at 1 September 2011 were \$78,968. We have one term deposit, the combined Jolly Fund, with \$64,941 at 1 September 2011. The Current Account at 1 September 2011 was at \$14,027.

Table 1: Financial status of membership.

	2011	2010	2009	2008	2007
Members – Current:					
Paid	268	148	172	89 [†]	252
Unpaid	140	240	163	202	44
Members - in arrears:					
1 year	-	-	36	37	37
2 year	-	-	39	36	2
3 year	-	-	-	2	-
Other:					
Honorary	11	11	11	11	11

Life	4	4	3	3	3
Legal*	1	1	1	1	1
Societies	5	5	5	5	5
Libraries	9	9	9	9	9
TOTAL	438	418	439	395	364

* Not a member; a legal requirement

† Not comparable with other years due to Visa processing problems in 2007/08.

Table 2: Type of membership

	2011	2010	2009	2008	2007
Ordinary	304	288	294	263	235
Corporate	15	15	28	31	32
Honorary	11	11	11	11	11
Life	4	4	3	3	3
Unwaged/Student	99	95	98	82	78
Other (Societies)	5	5	5	5	5

Total income (provisional) for 2011 was \$19,353.82. Our subscriptions income was \$8,733.31, which was our greatest single income item this year. Other sources of income were book sales (Freshwaters of NZ and the Entomological Bulletin: \$1,060.58) and interest from our term deposit (\$4,068.25). Expenses include S.I.L Trust student prizes (\$1,500) and Jolly Student Travel awards (\$800). A donation of \$10,000 was also made to the S.I.L Trust (as voted by members at the 2010 AGM). Income was exceeded by expenditure by \$3,872.51 in 2010/11. Formal request for approval of the Secretary/Treasurer's report will be posted out with subscriptions renewal notices later this year.

Motion: That the Auditor for the next financial year be Brown Webb Richardson Ltd., Hastings. (Janine Wech / David Hamilton – carried).

5. SIL 1987 Trust Fund:

Neil Deans presented the (unaudited) 2010/11 financial statement for the S.I.L Trust, prepared by Kit Rutherford. Notes from this are:

- The value of investments remained largely unchanged
- Three travel awards were made by the Trust during the reporting period
- There was no expenditure apart from bank fees
- The accounts were unaudited
- NZFSS transferred \$10,000 to the S.I.L Trust Fund

Motion: That the S.I.L Trust Fund report be accepted. (Roger Young/Janine Wech - carried).

6. Publications / Communications:

- Don Jellyman's plenary tribute to Bob McDowall – Don was thanked for his in-depth tribute to Bob "Bob McDowall – the man and his influence on Australasian fisheries science". The presentation will hopefully be accessible on the NZFSS website in the near future for members to view.
- Students who are recipients of the SIL Trust Awards: an extended abstract (two pages, including figures) will be uploaded onto the NZFSS website within the next month.
- Posters: no information was forthcoming regarding posters.
- Crustacean book: Mike Winterbourne is in the final stages of sorting figures prior to printing.

7. Future conferences:

- 2012 – Chris Arbuckle presented a brief overview for the 2012 conference, which will be held from the 3rd to 7th December in Dunedin. The venue will be the University of Otago, and the theme (taken from the Land and Water Forum) will be 'Limits'. The Chair of the organising committee is Gerry Closs.
- 2013 – The 2013 conference will be held in Hamilton, and combined with the Marine Sciences Society. No dates have been set yet, but it will likely be held sometime between June/August.

8. Awards:

- Best Student Paper Award – entries for this close on 30 September 2011.
- NZFSS medal – nominations should be forwarded to the Executive Committee for consideration.

9. Professional Code of Ethics:

- The Royal Society of New Zealand issued a Code of Professional Standards and Ethics on 25 November 2010 that all members of the RSNZ must comply with. As NZFSS is a constituent organisation of the Royal Society, David Hamilton will check to see if we need to formally adopt this code and if member's signatures are required.

10. General Business:

- Don Jellyman reported that along with the Le Cren medal, Bob McDowall received a sum of £1,000. Bob's wife, Ainsley, would like this to be donated into a memorial fund in Bob McDowall's name. Possible recipients for the award include student/early scientist/post-doc members.
 - This will be raised at the next Executive meeting, along with the possibility of **adding/matching funds from NZFSS to provide a more substantial funding base.**
- Phil Jellyman raised the possibility of incorporating a student voting system at future conferences, similar to the ASL student initiative ("apple award").
 - To be discussed and initiated within the student membership at future conferences.
- Golden Gumboot Award: due to the Australia-based conference, the 'trophy' remains in New Zealand (given the wooden base may not meet with customs approval). Neil Deans will collate entries for this year's presentation (minus trophy).
- Deniz Özkundakci put forward a recommendation that NZFSS adopt ASL practice of having a student mixer where there is opportunity to meet senior society members in a relaxed setting.
 - Deniz will liaise with Chris Arbuckle for the 2012 conference.

The meeting closed at 5:20 p.m.



17 New Zealand Freshwater Sciences Society 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 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 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.

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.



18 Membership application

How do I join?

Print out the following details, fill in the boxes and mail to NZFSS Assistant Secretary/Treasurer, Janine Wech, c/- NIWA, PO Box 8602, Riccarton, Christchurch 8440 or email j.wech@niwa.co.nz

Title: **Surname:** **Initials:** **First Name:**

Address:

Telephone: (main)

(other)

Fax:

Email:

Membership type: **waged** **student** **unwaged**

Please fill out the following permissions:

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

Choose one: **Yes** **No** **Please sign:** _____

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

Choose one: **Yes** **No** **Please sign:** _____

My preferred format for receiving the NZFSS newsletters is as a:

Choose one: **Electronic pdf** **Hard copy**

Brief List of Your Professional Interests:

Payment:

Waged/Corporate \$55

Student \$15

Unwaged \$15

Donation to S.I.L. 1987 Trust Awards* (optional) \$4

TOTAL AMOUNT \$ Make cheques payable to 'NZ Freshwater Sciences Society'

Payment by Credit Card:

Visa Mastercard (circle one)

Name on card:

Card no: Expiry date:

Signature:

Send to:

NZFSS Assistant Secretary/Treasurer, Janine Wech, c/- NIWA, PO Box 8602, Riccarton, Christchurch 8440 or email j.wech@niwa.co.nz

*The SIL 1987 Trust supports overseas travel awards for beginning NZ scientists and guest lecturer visits to NZ by eminent international freshwater scientists.