IT’S A WELL-KNOWN FACT that there’s never a dull moment in the world of aquatic ecology (well, that’s what we like to tell ourselves). There’s emergency fish rescues to do and habitats to build to keep our local eels in the manner to which they’d like to become accustomed...the challenges for an Aquatic Ecologist simply never cease. Good job we’ve got an ever-expanding bunch of clever boffins on-board to shoulder the load.

restoration of a treasure

TE WAIHORA / Lake Ellesmere

EOS Ecology have now kicked off three projects they were commissioned to lead within New Zealand’s largest ecological clean-up – the $11.6 million project to restore and rehabilitate Te Waihora/Lake Ellesmere.

The largest lake (by area) in Canterbury and the fifth largest in New Zealand, Te Waihora/Lake Ellesmere is a cultural treasure for Ngāi Tahu, an internationally important area for migratory wading birds and also a breeding ground for many indigenous fish species. Sadly, it is also one of New Zealand’s most polluted lakes.

Whakaora Te Waihora is a programme to restore the ecosystem health and mauri of Te Waihora/Lake Ellesmere. It is a joint programme between Te Rūnanga o Ngāi Tahu, Environment Canterbury, and the Ministry for the Environment. The focus for the initial five-year programme has been to implement works in six key culturally and ecologically significant focus areas. The team at EOS Ecology have been working at locations along the Halswell River (major tributary to Te Waihora/Lake Ellesmere) determining sources of sediment, designing riffle habitats and assessing fish and invertebrate communities in remnant wetland areas.

Why so Dirty?

The Halswell River discharges large amounts of sediment into Te Waihora/Lake Ellesmere – a matter of concern to both local residents and iwi. The EOS Ecology team have recently completed phase one of a Sediment Input Survey for the Halswell River, designed to identify where sediment is entering the river, from its source to where it enters the lake.

This investigation will incorporate a mix of field sampling and modelling to determine the key sources of sediment within the catchment. “Phase one has been all about catchment familiarisation. Our team has kayaked the river from its source to the lake during base flow conditions and have taken spot water samples from every tributary as well as upstream and downstream of each tributary input,” says Thomas Adamson, Soil & Sediment Scientist, EOS Ecology.

Future phases of the study will focus on rain event sampling and quantifying sediment loads entering the Halswell River. Using this information, the end goal of the study is to provide mitigation solutions which will ultimately lead both to a cleaner river and also to less sediment entering Te Waihora/Lake Ellesmere.
Keeping Juvenile Longfin Eels Happy

The Halswell River with its soft, silty riverbed is thought to be a bottleneck for the longfin eel fishery of Te Waihora/Lake Ellesmere. Preferring faster flowing water with a coarser substrate of cobbles, the juvenile longfin eels currently lack suitable habitats within the river. In the hope of increasing population numbers of this culturally important species for Te Waihora/Lake Ellesmere, EOS Ecology has completed the phase one concept plans for two new riffle sections within the Halswell River.

“We were engaged by Whakaora Te Waihora, due to our expertise in restoring and rehabilitating stream habitats. Our aim is to provide an exemplar of habitat restoration for both juvenile longfin eel as well as other fish and invertebrates. We’d like to showcase what can be done to restore a habitat in a system like the Halswell River in the hopes that it can be rolled out to other sites in the catchment if it is shown to be successful,” says Shelley McMurtrie, Principal Aquatic Ecology Scientist, EOS Ecology.

Involving a realignment of the channel to deal with existing bank erosion issues, EOS Ecology’s design also includes the creation of riffle sections with a mix of gravels, cobbles & boulders to form the substrate, the use of rocks and logs along the banks edge to provide additional cover and bank protection, and low-lying marginal habitat for flood inundation. With approval of the concept design received, work on the detailed designs are well underway.

A Wetland Survey with a View to Enhancement

The Ahuriri Reserves is an Environment Canterbury managed area of farmland and wetland remnants alongside the Halswell River between Tai Tapu and Motukarara. Environment Canterbury is writing a management plan for the Reserves, but with no information available on the area’s freshwater values, EOS Ecology was commissioned to ascertain its ecological value.

Involving the sampling of fish and invertebrates from wetland ponds and the small streams that flow through the Reserves, the EOS Ecology team then compared this baseline information with local and regional data. After determining the freshwater ecological values of the Ahuriri Reserves, EOS Ecology could provide recommendations for the future ecological enhancement of the area.

“The greater Whakaora Te Waihora project has a focus on ecological restoration. Our aim was to provide Environment Canterbury with the information they need to compile a management plan which incorporates realistic restoration options and also considers the inter-connectivity of the Ahuriri Reserves with the rest of the Te Waihora/Lake Ellesmere catchment” says Alex James, Freshwater Ecology Scientist, EOS Ecology.

Kirsty Brennan
Scientific Support Specialist

When she is not busy assisting the team of scientists at EOS Ecology with logistics, muddy fieldwork or developing monitoring programmes, Kirsty Brennan can be found immersed in an ongoing project to organise our GIS database.

Allowing for data to be stored, edited, analysed and displayed – a GIS is particularly useful for producing high quality, visually-appealing maps that display the results of data collected in the field. Applications of GIS could also include specialised analysis of datasets and the identification of critical locations for restoration or rehabilitation based on data collected.

“GIS is incredibly useful for telling the story behind scientific data. It allows you to create visual representations of datasets which go far beyond traditional graphs and which offer both a broader appeal and greater comprehension for the intended audience,” says Kirsty.

Shelley McMurtrie
Co-director and Principal Aquatic Ecology Scientist

‘Inspirational Alumni Award’ from the University of Canterbury at their mid-year graduation ceremony on 19th April, in recognition of her professional success and service within the science industry.

Only a handful of Inspirational Alumni Awards are bestowed each year, identifying trailblazers in their field whose success and service are a source of inspiration to others. “These awards are a relatively recent development, allowing us to showcase what our graduates are achieving with good biology training. The combination of Shelley’s skills in ecology, her entrepreneurial flair and her community engagement was exactly what we were looking for to inspire our young students” said Professor Matthew Turnbull, Head of the School of Biological Sciences.

An expert both in the impacts of urbanisation on aquatic fauna and in rehabilitating aquatic systems, she had been the ecology lead on several large post-earthquake projects. Her leadership and research skills were also showcased through her role in 2010/2011 as co-ordinator, fundraiser & communication strategist for one of the largest multidisciplinary research trips to the Subantarctic Campbell Island (www.campbellisland.org.nz).

The Inspirational Alumni Award also focuses on where an alumni has made a positive impact on their community or society, which for Shelley has been as Chairperson of the Fifty Degrees South Trust, a member of community groups, and sharing her expertise on ecological matters with the general public.

In receiving the award, Shelley joins an elite list of past graduates from the University of Canterbury selected during the last two years. “I feel very privileged to join the ranks of some very prestigious individuals in receiving this award. My time at UC was pivotal to my career direction and to my decision to stay in Christchurch and develop EOS Ecology. Hopefully others are inspired to develop a career in applied biological science!” said Shelley.
1–3. Sampling the Ahuriri Reserves streams and wetlands.

4–5. Young longfin eels are the focus of riffle designs.

6–7. A dry weather recce for studying sediment inputs to the Halswell River.
fish relocations & flood protection

KEEPING BUSY IN PALMERSTON NORTH

It’s been a busy year at EOS Ecology’s Palmerston North office with a variety of key assignments including reviewing flood protection consents for the Greater Wellington Regional Council (GWRC), an urban development on the Kapiti Coast, and two roading projects.

Roading & Waterways

EOS Ecology was hired by a civil construction company undertaking a major culvert project on SH2 near Dannevirke, to rescue and relocate fish. “The road was getting realigned and a dangerous narrow bridge replaced, which required the diversion of the Whakaratapu Stream. We carried out an initial survey to see if there were any dwarf galaxias fish (a small non-migratory native fish) present in the stream, and then relocated fish and crayfish to a safe location upstream from several sections of the stream as work progressed,” says Alex James, Freshwater Ecology Scientist.

In Wellington, we worked for the New Zealand Transport Agency (NZTA) to assess the potential effects of the Mount Victoria Tunnel extension on the area’s streams. “With most of the natural streams in Wellington city now piped, it is crucial we ensure the remaining open channels are not unduly impacted by development” says Alex.

Flood Protection Peer Review for GWRC

With consent applications prepared for flood protection activities along the Hutt, Otaki, Waikanae and Wainiuomata rivers, EOS Ecology were contracted to provide an independent peer review of the ecological component of these applications.

Flooding is a major hazard for parts of greater Wellington and GWRC’s activities along the Hutt River alone are estimated to avoid $1 billion of damage that could occur during large flood events. “The trick is to maintain these flood protection schemes in a way that also allows fish and invertebrates to flourish. We were proud to be entrusted to review such important consent documents which seek to continue flood protection activities but also ensure the freshwater fauna is not negatively impacted” says Alex.

Urban Development on the Kapiti Coast

The Palmerston North EOS Ecology office was also recently contracted to undertake ecological sampling in a drain within the proposed Ngarara urban development in Waikanae on the Kapiti Coast. The project involved the sampling of fish and invertebrates to determine ecological values and the production of an Assessment of Environmental Effects (AEE) to aid regional and local council resource consent applications.

“As part of this project we also collaborated with Landcare Research to produce an AEE on terrestrial vegetation. The Ngarara development is bordered by a wetland of high ecological value, so it made sense to get in a botanical expert to assist us” says Alex.

COMPLETION OF AVON RIVER PRECINCT IN-RIVER WORKS

Spanning more than two years and covering a 3.2 km section of the Avon River through the city centre, the in-river works portion of the Te Papa Ōtākaro/Avon River Precinct (ARP) Anchor Project is now complete.

As part of the Opus-led design consortium for the ARP, EOS Ecology’s Shelley McMurtrie was the Ecology and Design Lead for the in-river works package; one of the largest urban waterway revitalisation programmes in New Zealand.

Historically a transport route and centre for trading and food gathering for Ngāi Tahu, Ōtākaro/Avon River is a place of great significance for central Christchurch. “Enhancing the health of the river is at the very heart of the development of Te Papa Ōtākaro/Avon River Precinct. With EOS Ecology’s help, life has started to return to this treasured central city waterway – reinstating the Ōtākaro/Avon River as a prized source of mahinga kai,” said Rob Kerr, Development Director for Christchurch Central Development Unit (CCDU) Anchor Projects.

With almost 10,000 tonnes of silt removed, 15,000 m2 of gravel cleaned, the creation of key riffle habitats, and the narrowing of the low flow channel with ‘fresh plain’ build-outs, this project has revitalised the wellbeing of the river between the Antigua Boats and just east of Barbadoes Street. EOS Ecology Principal Aquatic Ecology Scientist, Shelley McMurtrie, says the in-river work has been a heartening project to work on. “The works are an example of what can be done to restore health to our streams in other parts of the city that have also been affected by many decades of urbanisation and, more recently, by the earthquakes,” said Shelley.

The 1.1 km of low build-outs (termed ‘fresh plains’) have an especially important role in maintaining river health. By narrowing the low flow channel and therefore increasing the speed of the water, these build-outs help protect the ecologically valuable gravel areas from silting up again. Shelley commented, “The native plants on the build-outs will also help take nutrients out of the water, while the rough boulder edging provides cover for native fish, especially large longfin eels. Sediment depositional zones will trap sediment, making it easier to manage the removal of sediment from the river in the future.”

While long-term monitoring is still being undertaken, the early signs are encouraging with an increase in habitat diversity, fish diversity, and trout spawning in key locations along the river. “A few days after building one of the fresh plains we found a large longfin eel in residence in one of the specially-created eel boulder holes – so it is nice to see they approve of the changes,” said Shelley.

EOS Ecology has a detailed habitat and biological monitoring programme they hope will shed more light on which elements of the in-river works have been most successful. The results of this ongoing programme will then be fed back to the global restoration research community through journal publications.
1–4. Fish rescue work in Whakaruatapu Stream.

estuaries and harbours

EFFECTIVE MANAGEMENT OF SEDIMENT

Estuaries and harbours generally act as a sink for everything draining in from the surrounding catchments. Capturing and retaining whatever flows in, the health of an estuary is compromised by this ongoing influx of sediment.

“At EOS Ecology, we look at catchment processes and the effects they have on receiving waterways and develop water quality monitoring programmes to provide information which would allow for effective management practices. It’s really important to look at the overall estuary processes – we assess how the estuary currently functions, where the sediment is coming from and where it goes to under varying conditions. Using that data, we can then determine how the estuary could function with a different approach to catchment management,” says Kirsty Brennan, Scientific Support Specialist.

To help address these issues, EOS Ecology has constructed a Soil & Sediment Team to provide clients with research-quality solutions. At EOS Ecology we address erosion and sedimentation with a systems approach, by recognising a continuum from source to transport to fate.

Flushing regimes of any estuary result in areas that fill up quicker than others and it is in these areas where problems such as the smothering of biota or sediment toxicity can occur. The surrounding topography also plays a big part in how quickly sedimentation occurs. Christchurch’s Port Hills, as an example, have a unique make up of soils which, combined with the steep topography, makes managing the swift flow of rainwater heading towards receiving environments more difficult. “In areas with steep hills surrounding a waterway, rainfall can have a more intense impact, sometimes creating somewhat of a negative cycle in regards to constant erosion. Part of our work at EOS Ecology is to identify and target areas around the catchment having the biggest sediment contribution and recommend specific catchment management practices to minimise the influx of sediment, thereby creating healthier receiving environments,” says Kirsty.

NEW STAFF PROFILES

PAUL SULLIVAN
ENVIRONMENTAL GEOScientIST

Bringing with him 17 years’ experience in the world of environmental science, Paul Sullivan joins the EOS Ecology team as an Environmental Geoscientist. His commercial career encompasses nine years of groundwater investigations in Canterbury, and four years on major projects in Australia working in dredging and port development.

Focused primarily on investigating sediments at the land-water interface, Paul’s background in hydrogeology, environmental geochemistry and environmental construction management brings a new set of skills to the team. His expertise will also be of use investigating aspects of sediment and erosion control on large-scale developments. In previous roles, he’s worked on “mega” projects, so is hoping to transpose some of that relevant learning to the rebuild and development activities in Christchurch.

THOMAS ADAMSON
SOIL & SEDIMENT SCIENTIST

Immersed in the murky world where dirt and water mix, you’ll find Thomas Adamson. Studying the why’s and how’s of sediment input into streams and rivers, Thomas’ role is about providing advice on how to stop this influx.

“Sediment is a major pollutant of New Zealand’s rivers. It smothers aquatic flora and fauna, degrades amenity values and blocks waterways. Working out where it comes from and how to minimise or prevent its input is of critical importance in restoring the health of our aquatic systems,” says Thomas.

In addition to advising for best management practice and compliance monitoring to meet consent conditions, Thomas’ role also involves designing and implementing research programmes to quantify sedimentation issues, monitoring the influx of sediment, hydrocarbons and other potential pollutants from industrial and natural sites, and using GIS mapping to display spatial results.

FROM THE SEDIMENT TEAM

2–4. The sediment team on the job.

5–8. Sediment-laden water and sediment sources.
Campbell Island’s
COOL & UNUSUAL MITES

Further proof that this planet continues to have strange and unusual species roaming around, the EOS Ecology scientists who were part of the Campbell Island Bicentennial Expedition brought back samples of some rather interesting, yet unidentified, miniscule mites.

With no descriptions existing of these bugs anywhere in the world, we sent specimens to the Netherlands, Russia, Germany and Poland, to experts in certain groups of mites in the hopes they’d be identified. Unfortunately, with only a small number of specimens available and only a few taxonomists specialising in a small group of mite types, no definite species identifications were able to be made.

While the specimens were found in our aquatic samples, some of the less commonly collected species are likely to be terrestrial mites that had the dubious honour of falling into the stream while we were sampling. There are likely new/undescribed species in the mix, but with little funding available for taxonomy work it is unlikely they will be described any time soon. Either way, this serves to remind us of the scientific discoveries – both major and mite-sized – lying in wait for those brave enough to travel to some of the world’s more remote locations.

A BUG’S LUNCH

Here at EOS Ecology, our lab technicians sure know how to have a good time. Take one Tanytarsus vespertinus larva (the adult is a fly commonly known as a midge), remove its tiny head and examine under a compound microscope to see what is inside. In this instance, inside the bug’s mouth our scientists saw diatoms which are single-celled algae and a food source for these larva. Bearing in mind how tiny these creatures are, it was exceptional to see what it had been eating when it was caught – it was like a sneak peek of a tiny animal’s lunch!

ID’ing ADULT STAGE FRESHWATER INVERTEBRATES

When collecting and identifying freshwater invertebrate samples from waterways, one clear limiting factor occurs – you will only ever find invertebrates in their larval stage in the water, yet some insects can only be identified during their adult stage.

No longer happy to be thwarted...two scientists at EOS Ecology have recently completed a course in the identification of adult stage freshwater invertebrates. Combined with the support of a small group of internationally-respected taxonomists, this training has allowed the lab team at EOS Ecology to tackle more complex projects such as creating comprehensive species lists.

This new expertise has proved useful in projects such as the Banks Peninsula Ecological Survey and the processing of samples from the Campbell Island Bicentennial Expedition. For these projects, the EOS Ecology lab technicians could determine if any endangered species were present, in addition to gaining a better understanding of species diversity at a given site.

NEW STAFF PROFILES

EMILY DEMCHICK
AQUATIC ECOLoGY TECHNICIAN

Basing her BSc (hons) Ecology at Massey University on freshwater invertebrates, Aquatic Ecology Technician, Emily Demchick has landed in exactly the right place in the lab at EOS Ecology. Spending many hours each week processing invertebrate samples from EOS Ecology field work or from external clients, she is happy to be engrossed in the fascinating world of bugs.

“I’ve recently been processing samples for some North Island Regional Councils and it’s amazing to see the range of invertebrates present from sample to sample” says Emily.

When not in the lab, Emily can be found in the field assisting with projects such as EOS Ecology’s annual estuary monitoring programme or freshwater fish and invertebrate surveys.

» emily@eosecology.co.nz

TOM MOORE
AQUATIC ECOLoGY TECHNICIAN

Having studied the impacts of nitrate-nitrogen on benthic invertebrate communities in the streams of the Canterbury Plains, Tom Moore brings a wealth of research and field experience to EOS Ecology.

After completing his MSc at the University of Canterbury, Tom joined the Freshwater Ecology Research Group (FERG), carrying out research investigating the use of denitrifying bioreactors to remove nitrate-nitrogen from Canterbury streams.

Tom’s focus on water ecology and field experience makes him a great addition to the EOS team. “It’s a great experience to be working with a team of enthusiastic people who all want to improve the understanding of freshwater ecology in New Zealand.”

» tom.moore@eosecology.co.nz
1. Some weird and wonderful mites from Campbell Island.

2 & 4. Collecting the adult flighted stage of aquatic invertebrates.

3. Nick and Emily in the lab.
producing engaging communications
FOR LYTTELTON PORT OF CHRISTCHURCH

In late 2014 effects of the proposed redevelopment at Lyttelton Port of Christchurch (LPC) were assessed by a range of expert consultants. This led to the production of more than 20 scientific technical reports. In April 2015 LPC commissioned EOS Ecology to develop a set of easy-to-read, visually-appealing summaries of selected reports for the general public.

Aiming to provide access to the raft of highly technical information available on topics such as water quality, ecology, noise & transport, the EOS Ecology Visual Communications team were tasked with working out how to most effectively group the various topics. Infographics were created to allow quick and easy communication of key facts. Now on their third print run, the summaries have proved to be a successful public communication tool for LPC.

“We invest a lot in scientific and technical assessments but often the final reports are not widely communicated or well understood. We decided to ask EOS Ecology to produce ‘plain English’ summaries of the information. The summaries have been a good way to display the findings in easy to understand graphics that pick up the main messages” reports Kim Kelleher, Environmental Manager at LPC.

LPC have distributed the summaries at their public information hub, Port Talk, on London Street, Lyttelton and handed out hundreds of copies to local people.

“I’ve had some really good feedback from both community and our regulators about this initiative – they have complimented LPC on finding ways to better communicate this information and make it accessible to everyone who has an interest in understanding more about the ecological health of the harbour” says Kim.

STUNNING IMAGES AVAILABLE FOR CLIENT REPORTS

Containing close to 5,000 images, the EOS Ecology photo library is providing clients with an extensive range of stunning images taken under/around New Zealand’s waterways.

The library includes a wide variety of images; from scenic shots taken midstream in a river through to close up photos of specific fish species in their natural habitat. What sets the EOS Ecology library apart from a standard stock photo service is the combination of precision photography skills with an expert knowledge of aquatic flora and fauna.

“Now the library is being catalogued we can search for an image and provide a proof sheet of options for a client, along with a quote based on the length of time and intended use of the image. Some clients also come to us to commission our photographers for an image which perfectly meets their requirements,” says Katie Wilson, Design Co-ordinator.

KATE WILSON
DESIGN CO-ORDINATOR

With extensive experience in cataloguing a photo library for the Canterbury Museum, Design Co-ordinator, Katie Wilson is the ideal person to tackle the mammoth task of cataloguing EOS Ecology’s growing photo library.

“During my time at Canterbury Museum, I was responsible for cataloguing and scanning their historic photography collection – mainly old photographs, glass plate negatives and lantern slides. I’m applying what I learnt there and using similar methods for cataloguing the EOS Ecology photo library to enable quick and easy access to the right image,” says Katie.

As a graduate in Graphic Design & Illustration, Katie is also involved with report and publication design for EOS Ecology clients. As a superb qualified Illustrator, Katie can also create beautiful illustrations on a commission basis for clients.

KIM HICKFORD
GRAPHIC DESIGNER

With a love of typography and cutting-edge design, Kim Hickford brings more than 20 years experience in graphic communication to her role as Graphic Designer at EOS Ecology.

Cutting her teeth at an “old school” printer where she learnt the basics, Kim moved to an Exhibition and Graphic Designer role at Science Alive followed by 18 years experience at an international advertising agency for national and international brands.

Kim’s role at EOS Ecology involves talking with clients to best understand their communication needs before heading back to the office to create design solutions with a high visual impact.

“I love taking ownership of a project and transforming complex information into interesting visual communication which is both appealing to look at and engaging to the target audience.”

NEW STAFF PROFILES
“There is no way people would have taken away copies of the actual technical reports, but these are graphically interesting with informative infographics, which communicate issues people are really interested in.” KIM KELLEHER, LPC
VITAL STATISTICS FROM AVON RIVER PRECINCT PROJECT

- **1,591** fish rescued
- **9,605** tonnes of sediment removed
- **9,630** native plants planted
- **15,000** approximate m² of gravel cleaned
- **1,100** m of fresh plains & boulder edgings built
- **5,000** m² of riffle habitat created or restored
- **0** adverse impacts to flood levels