

CAREX News

The CAREX project is funded by the Mackenzie Charitable Trust



Newsletter of the Freshwater Ecology Research Group

May 2015

Welcome to our May CAREX newsletter - here are highlights of what the research team has been doing over the busy summer field season.



Getting macrophytes under control

Six months into our macrophyte control trial, results suggest that hand weeding, weed mat, and herbicide spray are effectively reducing macrophytes. Plant (raking) and sediment disturbance also seem to be having an effect. In contrast, the shade cloth (which provides 60-70% shade) appears to be enhancing macrophyte growth by protecting plants from extreme temperatures. A weed mat and shading treatment are shown in the photo below. We have also started a trial to help us understand the timing and placement of macrophyte control activities and develop ways to measure macrophyte growth.



Sediment traps are working

By calculating the amount of sediment entering and leaving our waterways and at hotspots (tile and open drains) combined with information about flow and suspended sediment loads, we are able to assess the effectiveness of our sediment traps. For example, we have found the large sediment trap (12 m long x 0.7 m deep) installed at one site is capturing about 70% of the fine sediment entering the experimental reach.

Benefits of native riparian plants

Riparian planting is the most widespread waterway management tool in Canterbury and New Zealand. These plants can improve ecosystem function by providing additional food for invertebrates and fish. We are looking at environmental factors (e.g., flow, nitrates) that influence the breakdown rates of leaves and wood. We are also interested in how quickly different plant species breakdown and add organic matter to the waterway. We determined rates for willow, gorse, flax, *Carex*, and *Pittosporum* because of their use in riparian plantings. In-stream leaf and wood packs, as shown below, were used to assess breakdown rates.



So far, our results show no distinct relationship between nitrates and breakdown rates, although rates were faster at some sites. From a species perspective, willow and *Carex* had fast breakdown rates whereas flax (harakeke) was the slowest. Planting a diversity of native plants with a range of breakdown rates is ideal for stream health and will provide food for aquatic organisms at different times of the year. Flax however, because it was so slow to breakdown might not be a very useful source of organic matter to our streams. We are continuing this work next summer with additional riparian species.

Treating tile drain inputs

Establishing riparian buffers and adopting nitrate limits are commonly used tools to reduce nitrate levels in agricultural waterways. Our research this summer has shown that tile drains can be highly-localised point sources of nitrates. To remove nitrate from tile drain outflows at our CAREX sites, we are developing denitrifying bioreactors. In a lab-based trial, we found that bioreactors containing wood chips and coconut husks both removed approximately 1 mg/L of nitrate from stream water and that there was no difference in effectiveness between one-step and two-step bioreactors over 10 weeks. Based on these results, we plan to trial one-step wood chip bioreactors in streams later this year.

Habitat addition demonstration

Natural boulders and wood logs have been added to one of our waterways to demonstrate the value of habitat for freshwater insects and fish. Many agricultural waterways lack important habitat for freshwater animals. Monitoring has shown this habitat is being used by insects to lay their eggs and fish are using them for cover. Our plan is to trial a larger-scale demonstration later this year.



School & Community Outreach

In early April, we gave a presentation to year 13 biology classes at Riccarton High School on the impacts of agriculture on waterways and the tools we are testing to inform effective stream management and rehabilitation in Canterbury. Later that month, the students visited our Silverstream site and their challenge was to assess riparian management, measure water chemistry, and identify invertebrates.



In late April, the research team was invited to present to the Hinds Drains Working Party, drainage engineers and landowners on CAREX research being conducted in the lower Hinds area. Jon and Catherine co-presented a talk to more than 30 attendees, described the main issues facing Hinds drains, and showed preliminary results from our research. The presentation was followed by on-site gumboot visits to an aquatic weed trial and a large-scale riparian management demonstration site in lower Hinds with ample time for discussion among all those who attended. A follow-up meeting and gumboot visit is planned for late-2015 and will focus on sediment-removal and nutrient-remediation demonstration sites in lower Hinds.



Trustees site visit



In March, our trustees from the Mackenzie Charitable Trust visited one of our demonstration sites where they met landowners and postgrad students and reviewed our program so far.

The Living Water Program

Our Silverstream site in the Te Waihora/Lake Ellesmere catchment is part of the DOC-Fonterra Living Water partnership program. The goal of this nation-wide program is to protect sensitive water catchments through community-based projects.



Together, we aim to improve water quality, in-stream habitat, ecosystem health, and increase biodiversity in streams in the Te Waihora/Lake Ellesmere catchment. Our role in the project is featured on their website (www.fonterralivingwater.com).

Starting at the top

The US Environmental Protection Agency advocates for the protection and restoration of small headwater streams, which echos our CAREX view of "starting at the top". The health of these small streams are very important for downstream communities.



New CAREX team members



Brandon Goeller has recently joined the CAREX team to conduct his PhD on nutrient remediation measures. Originally from Pittsburgh, Pennsylvania, USA, Brandon completed his MSc in fishery science and aquaculture at the Humboldt-Universität zu Berlin in Germany. He has also worked on stream rehabilitation projects in Germany and the EU as an environmental policy consultant for Ecologic Institute. We are excited to welcome him to the project.

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