

CAREX News

The CAREX project is funded by the Mackenzie Charitable Foundation

Newsletter of the Freshwater Ecology Research Group

December 2015

Welcome to our December CAREX newsletter - here are a few things we are doing to kick off the spring and summer seasons.

Bioreactor installation underway

Landowners, digger drivers, and CAREX team members, led by PhD student Brandon Goeller, combined efforts to install bioreactors at two Hinds sites in October and November. The aim of the bioreactors is to reduce nitrate in tile drains before this water enters the waterway. We are testing several designs, including: edge-of-field denitrification bed, two-stage channel, and edge-of-drain culvert bioreactors. Bioreactors work by providing a carbon source (wood chips) and suitable conditions for microbes to convert nitrate to nitrogen gas which enters the atmosphere and is harmless. Edge-of-field bioreactors treat water moving from a paddock to a stream, whereas end-of-pipe bioreactors aim to treat water entering via pipes like tile drains.



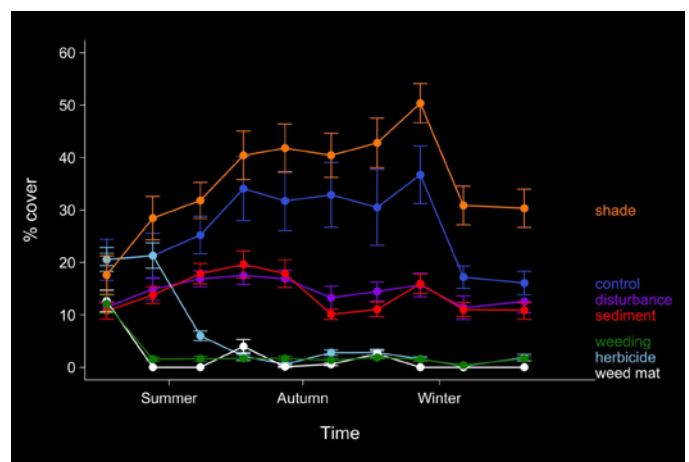
Diggers, pipes, and woodchips are all part of bioreactor installation.

We are using data loggers to monitor water quality downstream of the bioreactors. These continuously record nutrient levels, dissolved oxygen, etc. We use this information to determine water quality patterns and the effectiveness of bioreactors for nutrient reduction.



Reducing macrophyte cover

One year into our small-scale macrophyte control trial, we have found that intensive hand weeding, herbicide spraying, and weed mat effectively suppressed weed growth and weed cover by >80% as shown below. Bed sediment disturbance and physical plant disturbance also reduced weed growth, but to a lesser extent. In contrast, the partial shading, which provided 70% shade, actually enhanced weed growth by protecting the plants from extreme weather and temperature fluctuations. In a separate macrophyte shade tunnel trial, which simulated shading by riparian trees, we found that if shade was extended across the waterway then it was effective at stopping weed growth.



We have now set up and are monitoring 25 shade tunnels to establish optimum shade intensity (0 – 100%) for macrophyte control at one of our CAREX sites in Hinds, which will monitor monthly to determine effectiveness overtime.

What the MCI?

The Macroinvertebrate Community Index, or MCI, is commonly used to monitor and report on stream health in New Zealand. Macroinvertebrates are good indicators because they are affected by environmental conditions in a waterway and respond to both short and long-term pollution impacts. They also can show impacts that are not detected by water quality monitoring and are a very important part of the food web.

The index is based on the tolerance of macroinvertebrates to organic pollution and is a useful indicator of nutrient enrichment in waterways. All macroinvertebrate taxa collected at a site are assigned a tolerance score from 0 (pollution tolerant) to 10 (pollution intolerant) and the MCI score for the site is calculated.



The pollution-tolerant snail, *Potamopyrgus*, has a tolerance score of 4 in hard-bottomed streams.



The pollution-intolerant mayfly, *Deleatidium*, has a tolerance score of 8 in hard-bottomed streams.

MCI score	Water quality interpretation
> 120	Clean water
100 - 119	Possible mild pollution
80 - 99	Probable moderate pollution
< 80	Probable severe pollution

The range of MCI scores at our CAREX sites for 2013-2014 was 79 - 98, indicating probable moderate pollution at most sites.

Spreading the word

CAREX was well-represented at the annual New Zealand Freshwater Science Society conference in Wellington in November. The theme of the conference was "The changing freshwater landscape - collaboration, communications & communities". We gave oral and poster presentations on macrophyte control, sediment removal tools, bioreactors, and getting restoration tools implemented in the right place at the right time. Congratulations to Katie Collins who won the Best Applied Oral Presentation award for her talk on macrophyte control tools!

New resources available on website

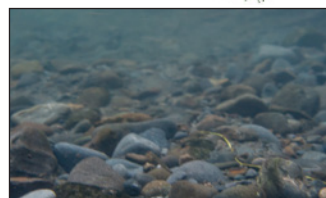
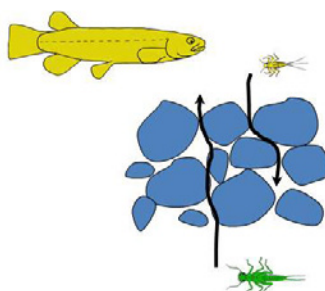
We have just added several new handouts to our website, that give you more information on the tools we are testing and the projects behind the key findings of the first phase of the project. You can find them under the Publications, theses & handouts sections of the CAREX and Mackenzie Project (Phase 1) pages on our website. We will be adding more handouts in coming months, so check back often.



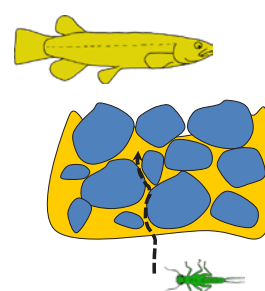
Does bed sediment affect fish?

Excessive fine sediment (<2mm) is as a significant contaminant in agricultural waterways. Previous CAREX research has shown that >20% bed cover effects invertebrates and insects but no research has been done on how fish are affected. High sediment levels can reduce fish food and clog refuges where fish might hide. This summer, Nicky Glenjarman (MSc) is conducting a South Island-wide survey to investigate the effect of bed sediment on fish diversity and abundance. Nicky will be trying to identify any possible threshold of sediment cover and what fish species (if any) are more sensitive to bed sediment.

Natural stream bed



High deposited sediment



Have you seen any kōura or kākahi?

Freshwater kōura (crayfish) and kākahi (mussels) live in streams and lakes throughout the country and are valued mahinga kai species. These species are under threat from pollution and habitat degradation and numbers are in decline throughout New Zealand. This summer, Environment Canterbury is conducting a survey to get a better idea of their distribution in Canterbury. For more information, please see: <https://www.surveymonkey.com/r/8K7V89B>

CAREX team news

We welcome three UC undergrad students to our research team for the summer. Alex, Roland and Stacey will be helping with routine water sampling, habitat assessments and running experiments until February. Stacey will also be working on a leaf litter breakdown experiment with different riparian plants.

It's a girl! Catherine Febria and her family welcomed a baby girl in October. Welcome to the team, Stella. Thanks for all the well wishes.



Alex



Roland



Stacey



Stella

Contact Information

Catherine Febria / Kristy Hogsden
 Freshwater Ecology Research Group
 School of Biological Sciences, University of Canterbury
 phone 03 369 5148/ 03 369 5179
carex@canterbury.ac.nz
www.carex.org.nz