Restoring Wetlands Research Programme Update 3: July 2012 to January 2013

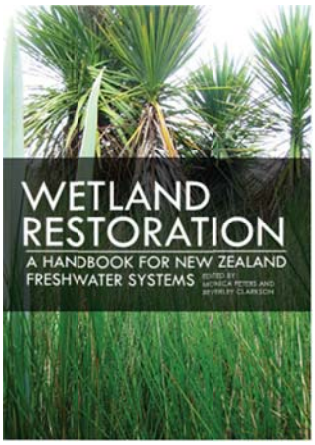
Bev Clarkson, Dave Campbell, Cheri van Schravendijk-Goodman, Hugh Robertson, Chris Tanner

MBIE review news

Hot off the press! We have just been advised that there will a review of freshwater programmes funded in the Freshwater Domain in the week of 8 April 2013. The Terms of Reference will be finalised in late January but are likely to centre on scientific quality and productivity, contract delivery, contribution to the new freshwater management framework for NZ, and any improvements/reprioritisations for freshwater management. Compilation of information for the review of our wetland programme will start as soon as we know more details but will likely involve researchers, partners, stakeholders and members of our Steering Advice Group (SAG).

Wetland restoration book available again

The 2010 wetland restoration handbook has been reprinted and will be available early in 2013. The book has proved extremely popular and is now out of stock. Although chapters are available free of charge on the web www.landcareresearch.co.nz/publications/books/wetlands-handbook there has been a steady demand for additional copies, so another print run, with only minor corrections, has been organised. We have received good sponsorship from Landcare Trust, Australia – the main impetus for the reprint, and also from LCR, LCT, UOW, DOC, and WRC.



The book can be ordered from www.mwpress.co.nz/store/viewItem.asp?idProduct=908.

Peters M, Clarkson BR eds 2010 (2012 reprint). Wetland restoration: a handbook for New Zealand freshwater systems. Manaaki Whenua Press, Lincoln, 275 pp.

Plant indicator

Wetland ecologists from around New Zealand: Lisa Forester (NRC), Paul Champion (NIWA), Kerry Bodmin (NIWA), Bev Clarkson (LCR), Paula Reeves (Wildlands), Philippe Gerbeaux (DOC), Peter Johnson (LCR), Brian Rance (DOC) attended a workshop in September to develop a tool for delineation of wetlands. A draft list of NZ wetland species classified according to the typical habitat in which they grow: obligate wetland (OBL), facultative wetland (FACW), facultative (FAC), facultative upland (FACU) or obligate upland (UPL) and technical guidelines on how to apply the plant classification and abundance to identify wetlands and their boundaries have been developed and the report will be available soon. The approach follows the USA Federal Wetland Delineation approach for vegetation, but the full USA system also requires criteria for soils and hydrology to be satisfied. Thanks to Meridian Energy for co-funding the workshop, and to Lucy Bridgman, Neil Fitzgerald and Mark Smale for logistical input.

WRRT project receives funding

The Waikato River Authority (WRA) approved two years of funding for a native plant restoration project on Te Takapuu o Waikato Island (co-led by WRRT and NIWA). This island was identified during the scoping trip with tangata whenua, the WRRT, DOC and Bev Clarkson as a site of

significance to the peoples of Maurea Marae in particular. The proposal includes employing a tribal member to undertake the key operational work, and to maintain a caretaker role on the island for the tribe, marae and research team - Cheri van Schravendijk-Goodman (WRRT), Paul Champion, Kerry Bodmin, and Bev Clarkson.

The overarching goal of the restoration work on the island is to find lowered chemical application and/or non-chemical methods for controlling pest plants such as yellow flag iris, sweet reed grass and alders. Ideas have included testing the potential for harakeke as a competitor to yellow flag, and the native purua grass against the sweet reed grass. Anecdotal evidence indicates that alders may also be a suitable nursery for kahikatea, and this will be tested with kahikatea seed balls being released under the alders present on the island. Because of the significance of the islands as marsh-type wetlands, and as potential riverine habitat for migrating wetland birds, this project falls under the overarching goals of the programme for extension of wetland habitat within the lower Waikato.

WRRT wetland scholarship

Advertising for the 2013 wetland scholarships generated a good level of interest, however, only one applicant was interviewed and subsequently awarded the scholarship – Rimutere Wharakura (Tuurangawaewae Marae). Rimutere has a background in Applied Food Technology Science and a BA in Maaori from Otago University. She has indicated a strong interest to diversify and expand her capabilities to include environmental-based sciences. DOC has confirmed that Rimutere will do the weekly work-experience component of her qualification at the Waikato Area Office. Much of her work experience will focus around biosecurity – pest animals, and plants.

WETMAK completed:

Congratulations to Karen Denyer, Monica Peters and NZ Landcare Trust staff for the roll-out of WETMAK: Wetlands Monitoring and Assessment kit. The resource has been developed for community groups undertaking wetland restoration projects and is available on-line at www.landcare.org.nz/wetmak. The kit has a series of modules which present useful advice on monitoring techniques and methods of assessing the effectiveness of any restoration work. Nardene Berry and Melinda Dresser (NZLCT) and Karen have been busy running free training workshops around the country, which have been greatly appreciated. WETMAK provides a user-friendly approach to monitoring, building on the 2004 wetland monitoring handbook www.landcareresearch.co.nz/publications/researchpubs/handbook_wetland_condition.pdf and the recent Wetland restoration handbook (see above).

Wetland monitoring programmes

Bev Clarkson and Hugh Robertson have been working (Dec 2012) with Andy Hicks, ES to develop a wetland monitoring programme based on the 2004 wetland monitoring handbook but refined and expanded to be compatible with regional council and DOC NHMS requirements. This includes a standardised plot and sampling approach, and a representative set of wetlands that incorporate wetland type, distribution, significance and other criteria. The system will also be the basis for a wetland monitoring programme currently being undertaken for BOPRC (Neil Fitzgerald, Bev Clarkson, Nancy Willems).

Canadian visits and linkages

Dave Campbell (University of Waikato) visited several Canadian peatland research groups during his recent sabbatical leave from July–December 2012. He was based at Carleton University in Ottawa and hosted by Elyn Humphreys, who has published extensively on ecosystem carbon exchange in peatlands and arctic ecosystems, and manages the Mer Bleue bog research site close to Ottawa. The Mer Bleue site has now been running for 15 years so has the longest complete series of wetland carbon and water exchange measurements of any wetland worldwide, and is a magnet for peatland biogeochemistry researchers. Dave visited research groups at McGill, Queens and Trent Universities and gave seminars on NZ peatland carbon exchange research. At McGill Dave was hosted by peatland biogeochemistry researchers Tim Moore and Nigel Roulet. Dave's visit strengthened links between the McGill group and the NZ wetland programme (Tim Moore has visited NZ several times and collaborates closely with Bev Clarkson), and it is likely we will see more Canadian researchers heading this way.

Autumn colours at Mer Bleue Photo: D Campbell

Kopuatai research site

University of Waikato researchers established an eddy covariance tower (photo) on Kopuatai bog in November 2011, which measures exchanges of CO_2 and methane (CH_4, since February 2012) between the peatland surface and the atmosphere. Kopuatai is now one of the relatively small number of peatland sites globally (and the only one in the southern hemisphere we are aware of) where these carbon gas exchanges are being measured. PhD student Jordan Goodrich has been using measurements of CO_2 exchange to characterise the light response of the *Empodisma robustum* plant

canopy, especially the relative efficiency of CO_2 uptake (photosynthesis) under cloudy and clear-sky conditions. He is presently writing up a paper on his findings.

Catherine Sturgeon will soon submit her MSc thesis on dissolved organic carbon (DOC) exports from Kopuatai. She has carried out an impressive field study of DOC variations in peat pore water under *Empodisma*, *Sporadanthus* and manuka vegetation types, spatially and seasonally. A major outcome from her thesis will be a new method for calculating DOC exports, and we hope to publish these results as a stand-alone paper.

DOC export rates will be combined with Jordan's calculations of annual CO_2 uptake and CH_4 emissions to derive the annual net ecosystem carbon budget (NECB) for the peatland. Knowledge of the magnitudes of CO_2, CH_4 and DOC fluxes and the overall NECB, and their sensitivities to environmental drivers, will be useful towards providing a baseline for peatland restoration efforts and for comparing to the greenhouse gas profiles of former peatlands now under agriculture. Also, it will enable modelling to explore the stability of peat formation under future climate change scenarios.

New MSc student, Alex Keyte-Beattie, has started her research at Kopuatai, on the role of the *E. robustum* canopy in the ecohydrology and CO_2 exchange of the bog. The *E. robustum* canopy is globally unusual for the large amount of standing dead litter, and its longevity. Alex will quantify the spatial variability of the canopy structure and density, its water balance and impact on evaporation rates and CO_2 exchange. This study will generate new knowledge about ecosystem functioning of *E. robustum* and its critical role as the primary peat-former.

Kopuatai research site Photo: D Campbell

The Kopuatai site is already attracting collaborative research opportunities. Researchers from the UK and Victoria University are trialling a new stable isotope method nearby that should shed some light on paleoclimates and their effect on peat formation rates. The University of Waikato is collaborating with Korean researchers who are using multispectral sensors mounted on the Kopuatai tower as part of a global synthesis study linking vegetation indices to CO_2 uptake. And in January 2013 a team from the Department of Conservation established a permanent "Tier 1" quadrat site just north of the EC tower.

Brief notes

- Positive news from DOC, with the Arawai Kakariki wetland restoration programme approved to continue until at least 2017. The AK programme is a partner in a number of MBIE research projects.
- Wetlands are being further considered in the national water reforms. MfE/DOC commissioned a workshop of wetland specialists to provide a National Objective Framework (NOF) for wetlands, which aligns with similar work on rivers, lakes, groundwater and estuaries. Hugh Robertson coordinated the workshop which often relied on data and research conducted under the MBIE programme. Participants included: Bev Clarkson, Chris Tanner, Philippe Gerbeaux (DOC), Anne-Gaelle Ausseil (LCR), Alastair Suren (EBOP), Paula Warren (MfE/DOC) and Chris Arbuckle (MPI). Expect results from this national limit setting work soon.
- Chris Tanner (NIWA) and others are making headway with their wetland fertiliser experiment in wetlands above Lake Clearwater (650m altitude, inland Canterbury) in association with DOC. The experiment is examining the resilience of inter-montane wetlands to elevated N and P levels. Fertiliser is currently being added at seasonal intervals to small plots of three vegetation types. Hydrological equipment will also be installed to account for the variation in water levels.
- Our grey willow control studies in Whangamarino in collaboration with DOC are progressing well. Helicopter spraying with glyphosate was undertaken in Feb 2012, with associated pre- and post-spray monitoring of vegetation, and aquatic and terrestrial invertebrates in sprayed and unsprayed plots. The next lot of monitoring is due in February-March 2013.
- Check out Daniel Collins' (NIWA) blog posts on wetlands for World Wetlands Day (2 February) featuring some of our research and outreach http://sciblogs.co.nz/waiology/

Published papers

Blyth, JM, Campbell, DI, Schipper, LA, 2012. Utilizing soil indicators to explain historical vegetation changes of a peatland subjected to flood inundation. Ecohydrology. DOI: 10.1002/eco.1247. http://onlinelibrary.wiley.com.ezproxy.waikato.ac.nz/doi/10.1002/eco.1247/full

Wagstaff SJ, Clarkson BR 2012. Systematics and ecology of the Australasian genus *Empodisma* (Restionaceae) and description of a new species from peatlands in northern New Zealand. PhytoKeys 13: 39–79. DOI: 10.3897/phytokeys.13.3259. www.ncbi.nlm.nih.gov/pmc/articles/pmc3391716/

Sorrell BK, Tanner CC, Brix H. 2012. Regression analysis of growth responses to water depth in three wetland plant species. AoB PLANTS 2012: pls043; doi:10.1093/aobpla/pls043. http://aobpla.oxfordjournals.org/cgi/reprint/pls043?ijkey=9QvIznYrbavgdzh&keytype=ref

Sorrell BK, Brix H, Fitridge I, Konnerup D, Lambertini C, 2012. Gas exchange and growth responses to nutrient enrichment in invasive *Glyceria maxima* and native New Zealand *Carex* species. Aquatic Botany 103:37-47. www.sciencedirect.com/science/article/pii/S0304377012001027

Watts C, Maheswaran R, Thornburrow D 2012. Beetle community responses to grey willow (*Salix cinerea*) invasion within three NZ wetlands. New Zealand Journal of Zoology 39:209-227. www.tandfonline.com/doi/abs/10.1080/03014223.2011.645838

Myers SC, Clarkson BR, Reeves PN, Clarkson BD 2013. Wetland Management in New Zealand – are current approaches and policies sustaining wetland ecosystems in agricultural landscapes? *Ecological Engineering.* Available on-line DOI link: http://dx.doi.org/10.1016/j.ecoleng.2012.12.097

Papers submitted:

Submitted: Clarkson BR, Moore TR, Fitzgerald NB, Thornburrow D, Watts CH. Water table regime regulates litter decomposition in restiad peatlands, New Zealand. Ecosystems.