

Restoring Wetlands Research Programme Update 2: July 2011 - June 2012

Bev Clarkson

The following is a summary of achievements during the second year of our 6-year wetland research programme funded by the Ministry of Business, Innovation and Employment (MoBIE; formerly MSI and FRST). For further information email Bev Clarkson at clarksonb@landcareresearch.co.nz.

Waikato-Tainui Technical Training Scholarships

Joshua Ormsby (Puurekireki Marae) and Jonathan Brown (Maurea Marae), our two Waikato-Tainui wetland scholarship recipients, have successfully completed their 1-year Certificate of Technology course at the Waikato Institute of Technology (WINTEC). The scholarships were funded and organised through the Waikato Raupatu River Trust (WRRT) subcontract, led by Cheri van Schravendijk-Goodman. Josh and John were taught practical field technical skills under the guidance of Scott Bartlam during fortnightly work placements and a 5-week summer internship within the wetland research programme. They became proficient in GPS navigation, plant identification, vegetation and invertebrate sampling, and experimental analysis and reporting. They produced an excellent end-of-semester poster on a nutrient enrichment experiment, which showed that inputs of phosphorus (e.g., from aerial fertiliser drift) can threaten our bog ecosystems as it inhibits the formation of peat-forming roots. The success of the training programme and the high quality of the students has been highlighted in the WRRT Publication He Piko He Taniwha 2012: (2) pp. 10–11 & 18 <http://www.waikatotainui.com/i/files/HPHTFebMar2012LowRes.pdf>.



Scott, Josh and John discussing features of harakeke

Other Waikato-Tainui initiatives: WRRT has established a tangata whenua working party of representatives from three marae management groups most closely affiliated with Whangamarino Wetland and Waikato River Islands: Rangi Mahuta (Huakina Development Trust), Erina Watene-Rawiri (Waahi Whaanui Trust) and Moko Tauariki (Ngaa Muka Development Trust). The group will ensure subcontract objectives and iwi aspirations are being met during the course of the programme. Planned projects include a wetland restoration case study at Rangiriri Paa, wananga programmes for training tribal members and rangatahi from local secondary schools, and baseline surveys of Waikato River islands as a first step in their restoration. The Certificate of Technology course and the wetland

scholarships will continue in 2013 with an emphasis on wetland biosecurity to expand the skill base of tribal members. A special thanks to Cheri for all her hard work in driving these initiatives.

Whangamarino experiment: effects of willow control on vegetation and invertebrates

Kerry Bodmin, Corinne Watts, Scott Bartlam, Danny Thornburrow, Bev Clarkson, and our Waikato-Tainui interns, Jonathan Brown and Joshua Ormsby had a busy 2 months sampling vegetation and invertebrates both before and after spraying of willows in half the Whangamarino experimental block on 8 February 2012. Sampling was not always pleasant with high water levels and hordes of mosquitoes to contend with. The research is aligned with the DOC Arawai Kākāriki project, and we thank DOC staff, particularly Lucy Roberts, Matt Brady, Kevin Hutchinson, Chris Annandale, Cynthia Roberts, and Ursula Brandes, for their assistance with the helicopter spraying operation as well as the sampling. The next sampling will be undertaken in 12 months' time to determine the rates and pattern of recovery and to plan specific trials for biodiversity restoration.



Joshua, Jonathan, Scott, Kerry and Bev in a rare moment minus mosquito nets



Bev re-measuring a plot – note the effective willow kill and the high water level. Photo: C. Roberts

Fertiliser Experiment

Chris Tanner, Kerry Bodmin, Bev Clarkson, and DOC personnel (Rosemary Clucas, Wendy Sullivan, Joy Comrie, Lorraine Cook, Hugh Robertson) set up a collaborative field experiment on assessing resilience of wetland vegetation to nutrient enrichment at Lake Clearwater, inland Canterbury (O Tu Wharekai; DOC Arawai Kākāriki programme), where the catchment is undergoing rapid conversion to agriculture. Plots were set up in three separate areas, representative of the main vegetation types, i.e. dominated by 1) *Schoenus pauciflorus*, 2) *Carex diandra* and *C. gaudichaudiana*, and 3) red tussock *Chionochloa rubra*. Fertiliser, consisting of P and two levels of N (low and medium), is being applied three times a year by DOC staff, at a fertilisation rate that is realistic in the context of likely agricultural inputs. Experimental harvest is planned for late summer 2015.



Rosemary and Chris applying fertiliser to one of the red tussock fertiliser plots

Restoring wetlands symposium Invercargill

Wetland programme members continue our major role in the biennial National Wetland Trust wetland symposium series, a national focus for the wider wetland community for up-to-date restoration research as well as knowledge exchange, training and networking. This year's symposium 'Wetlands – Are We Getting it Right?' was held in Invercargill from 21 to 23 March 2012 with 200 attendees. Contributions from wetland programme researchers (Chris Tanner, Kerry Bodmin, Bev Clarkson) and partners (Hugh Robertson, Monica Peters, Karen Denyer) included being on the symposium committee, organising a wetland monitoring session, testing module protocols at a community monitoring workshop, and giving several field-trip and oral presentations. Field trips to restoration sites at Awarua-Waituna Ramsar wetland, Waiau River, and Rance wetlands demonstrated the benefits of community and multi-organisational buy-in for improvements in biodiversity and water quality. We are looking forward to the next symposium – likely to be in Auckland in 2014.



WETmak: community wetland monitoring kit developed by Monica and Karen available soon on-line

Southland-Otago Wetlands Visit

Bev Clarkson, Scott Bartlam, Brian Rance (DOC), John Barkla (DOC) and Te Anau Area Office staff sampled a range of wetlands in Otago and Southland to help progress DOC's application for a new Ramsar wetland complex, and to fill in gaps in distribution and wetland type in the wetlands database. A highlight of the trip was encountering sea lions at Cannibal Bay on the way to a dune slack at False Islet in the Catlins. John was the hero of the day when he brought a charging bull sea lion quivering to its belly with a mere bamboo pole. Wetland highlights included a good quality swamp, fen, and bog complex at Dawson City, an amazing string bog at Dismal Wetland, and threatened species-rich communities in False Islet dune slack and Supply Bay lake turf. Thanks to Brian Rance, John Barkla and Te Anau DOC staff who organised and participated in the visit.



John and Brian sampling *Carex* vegetation at Lake Waihola



DOC staff from Te Anau Area office and Brian sample the turf at Supply Bay, Lake Manapouri

New *Empodisma* species

Plant systematist Steve Wagstaff and Bev Clarkson (in collaboration with the Landcare Research's Defining NZ's Land Biota programme) have described a new species of *Empodisma* (wire rush) in wetlands north of 38°S (the 'kauri line'). This means that *Empodisma minus* is now split into two species: *Empodisma robustum* north of a horizontal line running through about Te Awamutu, south Waikato, and *Empodisma minus* south of this line. Genetic, morphological and ecological evidence

supported this split. *Empodisma robustum* is more robust than *E. minus* and re-establishes by seed after fire, whereas *E. minus* is smaller and resprouts after fire. All the wire rush plants growing in the Waikato wetlands we are researching, e.g., Whangamarino, Kopuatai, Torehape and Moanatuatua, as well as those further north, are therefore *E. robustum*. The press release is at:

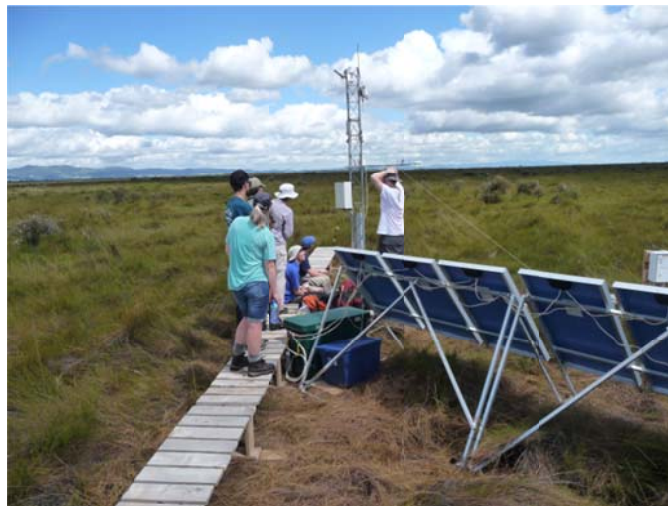
http://www.eurekaalert.org/pub_releases/2012-07/pp-ans070912.php



Empodisma robustum (wire rush) showing male flowers with stamens Photo: S Wagstaff

Carbon exchange and ecohydrology research at Kopuatai

The University of Waikato's research at Kopuatai bog is well underway. Jordan Goodrich started his PhD in August 2011 focused on CO₂ exchange over pristine bog vegetation dominated by *Empodisma robustum* (see article above), supervised by Dave Campbell, Louis Schipper, and Mike Clearwater. In November 2011 they used a helicopter to establish a research site 2 km from the eastern edge of the bog, consisting of a 4.5-m tower, eddy covariance sensors and a host of other instruments, a solar power system, and 40 m of boardwalk to protect the fragile vegetation and peat. Data are automatically transmitted from the site every morning, and Jordan visits the site about every 4–6 weeks. In addition to CO₂ exchange, Jordan is measuring seasonal growth patterns in the vegetation, and investigating whether these can be detected using satellite-based remote sensing data.



Earnest discussions at the Kopuatai research site. Photo: D Campbell

In February 2012 the measurement capability of the site was boosted by the addition of a state-of-the-art methane sensor, which is now providing the first continuous measurements of CH₄ emissions in a NZ wetland. Dave Campbell will be working up these data while he is on sabbatical leave at Carleton University in Canada from July to November this year. Dave will be working with Elyn Humphreys and Peter Lafleur, who run the Mer Bleue eddy flux site near Ottawa. For details about the Kopuatai EC site, visit: <http://www.ozflux.org.au/monitoringsites/kopuatai/index.html#intro>



Eddy covariance sensors tower over the *Empodisma* bog canopy. Photo: D Campbell

MSc student Catherine Sturgeon has been busy sampling water at Kopuatai and measuring dissolved organic carbon (DOC) concentrations under different vegetation types. Her goal is to determine the flux of DOC out of the bog, which will contribute to a complete ecosystem carbon budget (CO₂ + CH₄ + DOC) and its sensitivity to environmental and climate change. New MSc student Alex Keyte-Beattie will start her research later this year on “What is the functional role of the *Empodisma robustum* canopy in ecosystem exchanges of carbon and water?” A distinctive feature of northern NZ bogs and fens is the dense tangle of dead *E. robustum* stem material (around 24 tonnes/ha!) that shades the moist peat beneath. Understanding its functional properties will be a key to restoring these special wetlands. Dave comments that a bonus of visiting Kopuatai regularly has been seeing some interesting animals, including the first reported sighting of a gecko – an Auckland green gecko *Naultinus elegans*. Other fauna encountered include fern birds, NZ praying mantis, orb spiders, a locust, and jet black cockroaches inhabiting the battery box. Dave and team have placed six DOC 200 traps along their trail, and so far have killed eight stoats.



Auckland green gecko *Naultinus elegans* identified by Rod Hitchmough, DOC. Photo: D Campbell