

## **Dryland Intermediate Outcome Newsletter #4**

### **August 2007**

Here's a fourth update from the FRS&T-funded 'Dryland IO'. Some have noticed – and commented! – that a fourth newsletter failed to materialise at the end of June. We hope the new schedule ensures future newsletters don't coincide with the end-of-financial-year crunch.

In the last eight months we had the benefit of a national symposium on dryland restoration hosted by NZERN in Christchurch. In the autumn a multi-talented “cast of thousands” converged on Bendigo for a pilot multi-guild survey to answer the question “what are the benefits and drawbacks of woody succession for native biodiversity in drylands?”. In our experimental programme, the period has been one of consolidation and planning. We completed a major ecological experiment with a winter harvest, collected data from the other major experiment, began to write up some of our work, and developed a draft plan for our next six years of experimental work to understand limitations to woody succession across the dryland zone. This newsletter devotes space to all these happenings (starting with Strand 2).

### **Strand 2: Biodiversity of dryland woody communities**



What's that little brown bird? Robin, Deb, Pete, James and Grant learn bird sight and sound identification skills from Kev (right) in a distance sampling training session on Bendigo in March 2007.

Associations between dryland woody succession and native biodiversity are often speculated about, but have seldom been measured. What effect does the succession from grassland to shrubland and forest have on native species? Who wins, who loses, and where? In March, Deb Wilson and Grant Norbury started a major sampling program to discover what's in our woody and less woody dryland communities.

In March, Deb, Grant, Robin Wiedemer, Peter Lei, Marcia Green, Kate Ladley, Trent Bell, Jana Gevers, James Smith, Susan Walker and Kev Drew all converged on Bendigo for 10 days for the first full-on trial of what Grant is calling the “dryland gradient” project. Surveying biodiversity across different biotic groups (birds, lizards, invertebrates and vegetation) requires a cross-section of specialist skills and expertise. Detecting differences

between sites with statistical certainty requires sampling replication. Together these requirements translate into a major logistic exercise.

The nuts and bolts of survey are as follows. Three 1-km<sup>2</sup> blocks of different densities of woody cover are pre-selected. In each block, “distance sampling” is repeated on several mornings to estimate abundance of different birds along 2-km of flagged transects (we are awed by Kev Drew’s bird sight and sound identification skills). Hard work starts before the sampling teams even arrive, with the laying out and digging in of 30 grids of 25 pitfall trap pottles. Each survey day, the team baits each pitfall trap, then revisits the following morning, marks trapped lizards and collects any insects for identification. We also record vegetation ground cover, species composition, and 3-D structure along transects and in the lizard-insect grids using height-frequency methods.

Deb, Grant and team plan to coordinate two to three surveys each spring over the next few years to sample a variety of Otago, Canterbury, and Marlborough woody gradients.

### **Strand 3: Community and agency awareness**

NZERN’s February **Restoring the Drylands** national symposium was just not long enough. Two expertly guided field trips showcased the local dryland biodiversity (but did not convince visitors that Christchurch was either dry or warm). A full programme included talks ranging from the practical to the philosophical, PIPI<sub>4</sub> web tools demonstrations, and a panel discussion. A well attended evening interactive session discussed the problem of building community and agency support for dryland biodiversity conservation and vigorously debated the role of non-regulatory mechanisms. Geoff Rogers transfixed his after-dinner audience with intriguing and speculative ideas about relationships between extinct birds and dryland plants. And it was good to meet and learn from others working in dryland restoration. Congratulations NZERN: the conference gave us a sense of the practical and policy challenges ahead for dryland restoration, but also reasons to meet them, new tools and understanding to use, and new contacts who can help.

Grant Norbury has been visiting agencies in South Island drylands to discuss options for biodiversity protection and has given several talks to raise the profile of threatened dryland ecosystems. He is exploring corporate sponsorship opportunities for dryland flagship species, and continuing a variety of on-the-ground activities with individuals, agencies and ecological trusts to raise awareness and support for dryland conservation.

### **Strand 1: Succession to native woody communities**

In the last newsletter, we described two experiments that will help us to understand limitations to woody succession across the dryland zone—what these limitations are, where they occur, and how they operate. Here’s an update.

#### **The Soils Experiment:** *How do soil chemistry and moisture levels affect woody seedling growth in the drylands?*

In a freezing week in early July, Larry Burrows, Ellen Cieraad, Kate Ladley, Chris Berg, Dean Richards and Finn Scheele harvested 1200 woody seedlings from the shade-house experiment at Lincoln. The experiment, which started last spring, compares early growth rates of 14 native and exotic woody species across seven South Island dryland soils at two different moisture levels. In a slick production line, soil was washed off roots, heights were measured, and the seedlings were labelled and bagged for drying. As of this week, all seedlings have been dried and weighed, and the data are ready for analysis.

An early peek at the data (and a cursory glance at the pots before harvest!) indicate major differences between species, soils and water levels. We anticipate interesting findings. Larry and Ellen intend to follow up with reciprocal field transplants (more next newsletter).



Various stages in the life of the soils experiment at Lincoln from December 2006 to July 2007.

**The Bendigo Experiment:** *The role of competition and herbivory in seedling establishment in the drylands: a pilot experiment at Bendigo, Central Otago.*

In early May 2007 Kate Ladley, Adrian Monks and Lena Ohnheiser put the Bendigo experiment to bed for the winter, draining the watering system and generally ensuring that we were on top of maintenance. This 264-plot experiment measures the effects on the germination, survival and growth of four dryland woody plant species of competition (lowered with herbicides and trenching), herbivory (reduced by exclosures) and water (added with irrigation).

We have not yet observed any woody germination (probably due to a late setup last spring) but some strong treatment effects on the non-woody vegetation were apparent by autumn (see photos!). We have captured these effects in a sub-sample of plots by measuring biomass and species composition. Though we are yet to process all the samples, we expect (unsurprisingly) big effects of herbivory and additional water (equivalent to 1.6 mm rainfall per week). As insurance against poor germination of the seed sown into the plots, we have been growing seedlings in the glasshouse for transplanting this spring.



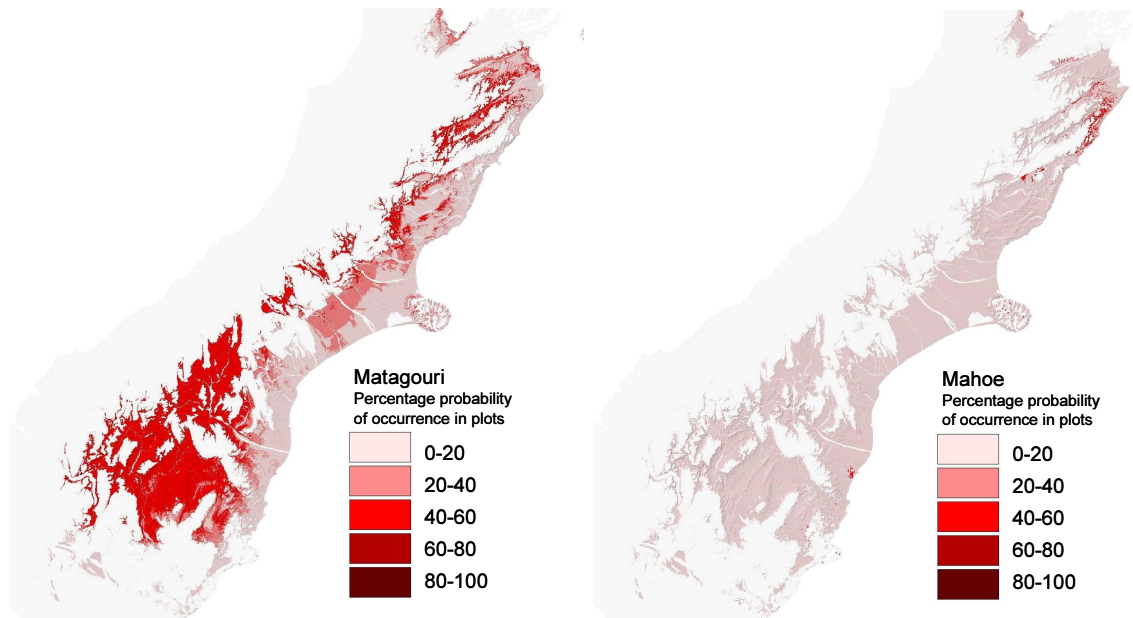
Kate and some of the Bendigo treatments in Autumn

## Which species where?

Which woody species are the best candidates to lead secondary succession in drylands and where? Our last newsletter described the database we built of dryland woody species locations. We said we'd used the database to predict the potential distributions of different woody species in seral woody communities across drylands, based on the environmental characteristics of the places they now occupy.

Unfortunately, there was very little plot information available from drylands in the North Island. Because we need information on presence *and* absence to run the models, we've had to restrict predictions from the study to the five South Island dryland zones.

The maps below show outputs of two models. They show the percentage of woody communities with <4 woody species predicted to contain matagouri (a widespread dryland woody species) and mahoe (a less widespread species in drylands).



The predicted probability of two different species occurring in woody communities of <4 woody species across the dryland zone.

A simple way to summarise multiple woody species maps like these is to calculate the average predicted probability for each dryland environmental type. We've done this, for woody communities in four richness classes. We are writing up the results in a research paper and will keep you posted on its progress. Meanwhile, let us know if you'd like to see any of these prediction maps, and/or a preliminary summary table from this work: sadly copyright formalities mean we aren't able to post these on the web prior to publication.

## Planning the Strand 1 experimental programme

IO Researchers have been doing a lot of thinking about how we will progress the experimental programme in Strand 1 over the next six years. We estimate we have funding for about 1900 researcher and technician hours per year (and sinking) in this Strand, and operating funds are inconveniently finite. In the first eighteen months of the IO we built research capability and databases, talked to a host of experienced people, and dipped our toes in the water with 'pilot' experiments that taught us much and will continue to inform us.

We drew this all together in the last 6 months, and developed a rationale for where we think we should place our effort in Strand 1 over the next 6 years of the IO. In an iterative process led by Adrian Monks, we refined, grouped and ranked a very long list of potential

research questions. Researchers then met to develop our thinking about the experimental approaches we would take to answer them, given our funding constraints and the experience we have gained so far. Three major contexts in which information on establishing indigenous woody species in drylands is lacking are : (1) native wood into grassland (primary woody succession); (2) native wood into exotic wood (secondary succession); and (3) native wood into primary native wood (also secondary succession). We also identified general experimental questions about seed ecology and species environmental tolerances that run across these three contexts. These contexts form the structure of a draft experimental plan that proposes twelve experiments and a timeline for them. It also identifies general questions we propose to address through non-experimental methods, and/or that are being addressed by other research teams. The plan will remain a ‘live’ document that responds to input from and the aligned initiatives of IO partners and end users, and will be modified astutely in response to experimental successes and failures. Let us know if you would like a copy—we would welcome your feedback. More next newsletter.

### Collaborations and student news

The Miss E.L. Hellaby Indigenous Grasslands Research Trust has funded Emily Weeks’ PhD to work on remote sensing of grassland change with Drs. John Dymond and James Shepherd, supervised by Professor Bruce Clarkson in the Department of Biological Sciences, Waikato University, and Susan Walker (Landcare Research, Dunedin). This is great news and Emily starts this spring. On the other hand, our attempts failed to find the funding for a PhD project investigating facilitation and/or inhibition of native woody species by common sweet briar and broom. Congratulations to Jamie Wood who submitted his Otago University PhD thesis on pre- Late Quaternary evolution of the dryland ecosystem, Central Otago. The thesis gives fascinating hints about what was going on in the weird and internationally unique bird-dominated dryland ecosystems before humans arrived, and was co-supervised by Susan Walker. We look forward to the papers! Robin Wiedemer has left Dunedin to further her tertiary studies in the US. She made a huge contribution to the IO over the last 2 years, and we wish her well. Plans are advancing for a experiment to test establishment of primary and secondary native woody species as seeds (establishment) and seedlings (growth) across a series of treatments of existing woody weeds (mainly broom dominant) on the Rangitata floodplain at Ealing Springs, in collaboration with Nick Head and Kennedy Lange (DOC).

### Websites

#### The Dryland web page is operational!

This web page provides access to documents relating to our research and activities. It also posts our newsletters, publications, reports, and many of the talks we give. The link is: [http://www.landcareresearch.co.nz/research/obi.asp?Proj\\_Collab\\_ID=28](http://www.landcareresearch.co.nz/research/obi.asp?Proj_Collab_ID=28)

Let us know how you find the web page: feedback and suggestions would be good.

The Dryland IO is part of a collaborative research initiative called Sustaining & Restoring Biodiversity (SARB for short). Visitors to our revamped website ([www.landcareresearch.co.nz](http://www.landcareresearch.co.nz)) can now access information about other programmes within the SARB OBI and those in the many other collaborative research initiatives Landcare Research is involved in. On the website home page, select **Collaborative initiatives** from the **RESEARCH** tab on the menu bar.



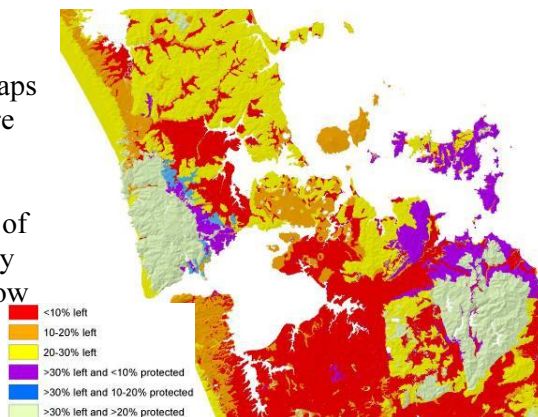
## Record your lizard sightings!

Ever wanted a place to record your lizard sightings? A new web-based “portal” is specially designed to hold your observations and to help you create your own databases, distribution maps, graphs, and species lists. The IO helped the New Zealand Biodiversity Recording Network (<http://www.nzbrn.org.nz>) build a portal specially for reptiles and amphibians. (See also our last newsletter). Please try it out and let us know how you get on!



## Threatened Environment Classification

Downloadable User & Upload Guides for the Threatened Environment Classification, and maps for political regions (districts to come soon), are now freely available thanks to aligned Environlink funding. The Threatened Environment Classification includes Priority 1 of government’s national priorities for biodiversity on private land. Much of what you need to know about the Classification and National Priorities can be accessed on the Action Bio community website <http://www.biocommunity.org.nz>



## Papers and talks

On our website you’ll find pdf files of many of the talks and presentations we have given in the last two years, including those presented at the NZERN conference. We’ll keep posting talks as we give them. Congratulations to Deb Wilson and coauthors whose paper “Sampling skinks and geckos in artificial cover objects in a dry mixed grassland–shrubland with mammalian predator control” (derived from our joint work with DOC at Macraes Flat) has been accepted by the New Zealand Journal of Ecology.

## Thanks!

Sincere thanks to many people generously gave time, advice, and logistic and practical help to the IO in the last eight months. DOC’s Mike Tubbs, Rob Wardle and Tim Whittaker advised on potential study sites for the “dryland gradient” project, and the Alexandra AO for loaning us equipment and providing much ad hoc and in-kind assistance with Bendigo experiments and surveys. George Ledgard and Chris Stowe laboured many long hot hours setting up pitfall grids, ditto Lena Ohnheister (a student volunteer from Germany) with the Bendigo harvest. Nick Ledgard (Ensis) is consistently generous with knowledge and steers us in useful directions: thanks Nick! Nick Head and Kennedy Lange have worked persistently to get the Ealing Springs experiment up and running, and we thank Adrian Cogle and George Iles (Raukapuka AO) for community relations advice. Simon Moore, Geoff Rogers and Theo Stephens continue to improve our thinking and facilitate liaison within DOC, most recently with the Strand 1 experimental plan. We also thank Karen Boot and Gaye Rattray for lab assistance with the pot harvest this winter, and many LCR colleagues for frank advice and helpful information on many aspects of the IO.