

Dryland Intermediate Outcome Newsletter #2

June 2006

We are now nearly 12 months into the 8-year FRS&T-funded 'Dryland IO', and here's a second 6-monthly update on what we've been up to and what we will try to do next.

Work in progress

The Dryland IO aims to reverse biodiversity decline in drylands "through increased indigenous woody species dominance and security of threatened biota, and greater appreciation of their value". We've discovered in the last 6 months that there is already an enormous appreciation of dryland ecosystems out there, especially among those working towards dryland native biodiversity and ecosystem protection within a range of agencies. The challenge these agencies face is communicating more widely the value of dryland biodiversity, and winning the community mandate to work directly to protect it. For researchers in Dryland IO, the challenge is to develop the technical understanding required to achieve biodiversity gains; we think we'll do this most successfully if we work directly alongside practitioners in the field. In this newsletter we'll describe a little of the three "strands" of work we have in progress, starting with Strand 3 and working back.

Strand 3 Community and agency awareness

Our goal in Strand 3 is "Improved public appreciation, translating into policy and operational initiatives that improve representation and management of dryland biodiversity". Grant Norbury spent the autumn talking with a wide range of people who work for dryland native biodiversity and ecosystem protection within regional and district councils, Department of Conservation, QEII National Trust, Landcare Trust, and private contractors. The experience, insights, wisdom and information brought by all contributors was compiled into an awareness strategy, aimed principally at agencies and groups with biodiversity responsibilities.

The document reviews the approaches taken by agencies in promoting awareness and participation, discusses further actions that can be taken, considers where the greatest benefits for dryland biodiversity may be achieved, and suggests a five-component strategy to achieve them. The strategy ends with a draft action plan, which can only be sensibly achieved through combined inputs from a variety of groups and agencies. It recognises a need for a Dryland Biodiversity Support Group and an Action Plan Coordinator: forming this group and identifying funding for a coordinator are likely to be key next steps.

Helpful responses to the final circulated Draft Strategy are still coming in as we write this. The final document "Building community and agency support for dryland biodiversity conservation: an awareness strategy" will be made available on the Landcare Research website... at least as soon as we have a Dryland site organised (see comment under **Publications and documents**, below).

Strand 2 Biodiversity of dryland woody communities

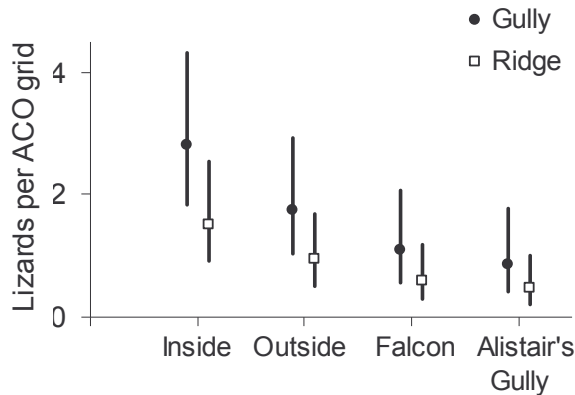
The primary research question in this strand is:

- What are the benefits and drawbacks of woody succession for native biodiversity in drylands?

Before we can answer this, we must develop new, reliable sampling and monitoring methods for the species we will encounter – many of which have not been well studied in the past.

This summer, Deb Wilson led a team evaluating the utility of ACOs (artificial cover objects – small corrugated sheets of Onduline cladding) for determining abundance of common lizards

in dryland habitats, and the utility of discs cut from pine logs for sampling ground-dwelling invertebrates. Some of the early (unpublished) results of this work are shown below:



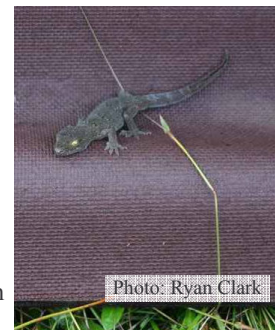
Above Average number of lizards (common skinks, McCann's skinks, cryptic skinks, and common geckos) counted per grid of 16 ACOs on one morning in March at Macraes Flat. The graph compares gully and ridge habitats, and four sites with different levels of mammal control: Inside DOC's mammal-proof fence; Outside the fence and the Falcon site, both of which have intensive control of mammalian predators through trapping and poisoning; and the Alistair's Gully site, where no mammal control takes place. Error bars show 95% confidence intervals.



Sampling lizard ACOs is for early birds.

Above Robin, Pete and Deb check an ACO for lizards, and mark the catch.

Right A slow gecko in an ACO on a cold morning.



Progress in Strand 2 has been boosted by the sharing of knowledge, experience, data, methodologies, field sites and field staff with the dryland arm of the FRST-funded Multiple Pests Dynamics project, Chris Jones' FRST-funded postdoctoral study, DOC's Grand and Otago Skink Recovery Programme, and Marieke Lettink's PhD study. Thank you all.

Simple counts of lizards under ACOs could prove a robust and practical method for monitoring dryland biodiversity in any backyard – but it is strictly for morning people.

Strand 1 Succession to native woody communities

In this strand, we are aiming to develop the technical know-how to achieve restoration at broad scales. The research questions driving Strand 1 are:

- What are the limitations to succession from grasslands to native woody communities across the dryland zone? and
- What practicable, broad-scale solutions can be developed and implemented to overcome these?

The work will involve collation of existing distribution and plant trait data, field studies, and experiments. Our focus so far has been desk-bound collation of existing data to underpin the IO. So lots here on databases – sorry about that. Three news items on three work areas:

1. Dryland Woody Species Distributions Database

This database is up, running and populated. Robbie Price undertook the mammoth task of designing a database structure and programming an input “skeleton” that coped with gremlins inhabiting a multiplicity of datasets collated by numerous people over many years. The database now holds most of the extensive existing spatial data on woody species distributions in drylands we could lay our hands on, and should prove a valuable resource. We have many

people in numerous agencies to thank for their assistance, and appreciate the forbearance of database administrators within DOC and Landcare Research and our Landcare Research computing support team (especially Guy Harris and Nick Prouting).

Our next steps include summarising the data to determine what woody successions are naturally occurring, and where (see **The year ahead**, below), producing improved maps of potential natural woody vegetation in New Zealand drylands, and linking the database to our traits database (below).

2. Dryland Woody Traits Database

Larry Burrows, Colin Meurk, Mark Smale and Ellen Cieraad, with help from Nick Spencer, Linda Newstrom, and Peter Bellingham, are collating a database of traits of native and exotic plant species that frequently occur in New Zealand drylands (or used to occur, prior to Maori and European settlement). This work aims to increase our understanding of the main limitations to succession in drylands, and to indicate species that may play an important role in the rehabilitation of these ecosystems.

The focus is on traits that play a role in limiting or enhancing woody species establishment in the drylands – for example, pollination and dispersal agents, how often and how many seeds are produced, how long seeds are viable in the seed bank, and potential for resprouting after grazing or fire. This information is being gathered from the literature and expert opinion. Using the database, we should be able to systematically identify groups of species with traits that give them the highest potential for low-input regeneration and establishment in the drylands. Linking this information to the distributions database will help us determine what species could best be re-established where, and what type of low-input manipulations might be appropriate.

Again, we have been helped enormously by others: for example, Jorge Santos and Nicky Robb (DOC Motukarara Nursery) and Joe Cartman (Christchurch City Council Nursery) who shared their extensive experience with seed collection around Christchurch and Canterbury. Prof. Peter Bannister (University of Otago) gave us his entire, compiled and unpublished data on the frost tolerance of woody species.

3. The Bendigo experiment?

Assuming we gain the consent we await from DOC's Central Otago Area Manager, Adrian Monks will shortly set up our first experimental project at Bendigo, in Central Otago. Adrian declined an invitation to work at DOC's Aldinga site near Alexandra because it "didn't have enough rabbits"! The experiment is a pilot, aiming to learn the ropes required to establish a set of trials across representative dryland sites in the next 7 years.

This particular experiment will look at the effects of water, competition and herbivory on germination, growth and survival of dryland woody species, and assess whether the effects are species-dependent. We will also take growth measurements and assess impacts of "artificial herbivory" to build a model of dryland seedling establishment that can be applied more widely.



Open kanuka dry shrubland at Bendigo

Celebrations

It's great news that Landcare Research has recognised a need to develop our capability in herpetology. A Capability Fund project led by Grant Norbury will invest in Trent Bell's development as a specialist herpetologist. Trent (right) is one of our research technicians in Alexandra, has bred many native reptiles in captivity, including Duvaucel's geckos. He has attained the highest-level wildlife permit for native reptiles and amphibians, enabling him to keep endangered species. Trent has also worked in conservation projects such as Boundary Stream Mainland Island and more recently at Macraes Flat. Lizards are a key flagship group for dryland biodiversity, so it will be a great bonus for the Dryland IO to have Trent supported by this aligned funding. Another honour – the University of Amsterdam awarded Ellen Cieraad 2nd place in their university-wide MSc thesis competition – and even better, they funded Ellen's whirlwind 10-day trip from New Zealand to Amsterdam to collect her award! Finally, Marcia Green – a key member of Deb Wilson's "Strand 2" group over the summer – has just joined the staff of Landcare Research. All three young researchers working in the Dryland IO represent much needed capability-building in dryland ecology.



Finally, the conservation of the Otago skink (through the Central Otago Ecological Trust's proposed predator-proof Mokomoko Dryland Sanctuary near Alexandra) was highlighted by the community as the top priority in submissions to the Central Otago District Council long term council community plan (LTCCP). This is fantastic news.

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Proposals supported

Neither Trent Bell's nor Mark Smale's TFBIS proposals submitted in January were funded in that round. However, Trent Bell's proposal for an online encyclopaedia of New Zealand lizards was resubmitted in this month's round, with even stronger letters of support from a range of end-users, including the SARB OBI and the Dryland IO.

Geoff Rogers (DOC RD&I) is helping Amadou Camara and Prof. Bastow Wilson (Otago University) to develop a PhD proposal on dryland shrubland community dynamics aligned with the Dryland IO research. Amadou has studied Negev Desert shrublands and is keen to increase our (currently poor) understanding of dry shrublands in New Zealand.

With Rob Phillips (ECan), Susan Walker and Ellen Cieraad have been given the go-ahead from FRST to develop a proposal to transfer our "threatened environments" add-on to LENZ (Land Environments of New Zealand) using Envirolink Tools funding. We propose to develop the tool to an appropriate standard and run a series of training workshops for regional and local authority staff nationally. The relevance for achieving biodiversity gains in drylands lies in improved ability to identify and advocate for the protection of places where remaining indigenous communities are significant because they are rare and poorly protected. Richard Bowman (Environment Southland) and Grant Norbury also have the go-ahead from FRST's Envirolink Fund to measure the impacts of pest animals on indigenous biodiversity, and the benefits afforded by pest control, across a range of habitat types.

While compiling the distributions database, we learned much about the state, storage and availability of some of New Zealand's biodiversity data – not all of it was good news. We expect that more bids to TFBIS will be forthcoming this year.

The year ahead

Our workplan maps out a busy year ahead.

Strand 1 Succession to native woody communities: We plan to complete our distribution and traits database based on existing information, compile summary information from the data (potential species distributions and traits information for dryland woody species) and make it available on the Web. We will design and implement a survey-and-measurement programme to gather remaining essential trait data that does not already exist. We will query our databases to identify the best woody species for establishment trials at different dryland sites, and plan a more comprehensive programme of experimental manipulation in the field.

Strand 2 Biodiversity of dryland woody communities: We will work with DOC scientists to systematically develop the basis for selecting animal groups to survey in relation to woody succession across drylands, and develop hypotheses about how they are likely to be affected by increasing woody dominance. We will design and initiate a stratified sampling programme to test these hypotheses in the field. At the same time, we will continue to develop our sampling methodologies. We also aim to complete spatial modelling to map the past, present known, and potential distributions of dryland lizards (work led by Mandy Tocher, assisted by Adrian Monks and Jake Overton) and make these available on the Web.

Strand 3 Community and agency awareness: A lot to do here. Grant is still receiving responses and suggestions for key milestones. The year ahead will involve setting up the mechanisms and working with groups with biodiversity responsibilities to implement some of the milestones identified.

Publications and documents (January–June 2006)

SARB (Sustaining and Restoring Biodiversity, our umbrella “OBI” or Outcome Based Investment, led by Bill Lee) plans to develop a space on the Landcare Research website early this financial year. The site will host information from the five “IOs” including the Dryland IO. We have a number of documents waiting to go onto it, including a 2-page summary of what the Dryland IO is about.

- Ellen Cieraad’s report: “The role of species interactions in a grassland-woodland transition: a literature review” scans international research on woody successions, highlighting the role and importance of plant–plant facilitation across stress and succession gradients. We aim to get this onto the Web – until then copies are available on request from me (address below).
- Remember Geoff Rogers, Susan Walker and Bill Lee’s *Science for Conservation* 258 “The role of disturbance in dryland New Zealand: past and present” is available for downloading at <http://www.doc.govt.nz/Publications/004~Science-and-Research/Science-for-Conservation/089~2005.asp>
- The work and table underpinning the “threatened environments” tool is available at http://www.landcareresearch.co.nz/databases/lenz/downloads/New%20Zealand_indigenous_cover.pdf and http://www.landcareresearch.co.nz/databases/lenz/downloads/lenz_threat_classification.txt
- A paper derived from this work in the *New Zealand Journal of Ecology* by Susan Walker and others is in press and on the NZ Ecological Society’s website at: http://www.nzes.org.nz/nzje/new_issues/NZJecol_WalkerEtAlIP.pdf

Upcoming conference presentations and talks

There will be at least two dryland-relevant presentations at the third joint conference of the New Zealand Ecological Society and the Ecological Society of Australia. "Ecology across the Tasman 2006" will be held at the Kelburn Campus of Victoria University of Wellington, 28 Aug to 1 Sept. See: <http://www.vuw.ac.nz/ecology06>

- Ellen Cieraad will present a paper entitled "Implications of plant-plant interactions and other plant traits for rehabilitation of New Zealand drylands" – findings from her recent review of interactions in grassland-woodland transitions, and our work on gathering information on the life-history traits of dryland woody species will be covered.
- Jamie Wood will present findings from his Otago University PhD work so far: "In the heart of a New Zealand desert: Reconstructing the late Holocene, semi-arid ecosystem of the Cromwell Gorge, Central Otago, South Island, New Zealand".

We are looking forward to gathering at and contributing to the NZERN National Conference, "Restoring the Drylands" from 16 to 18 September 2006, Wai-ora Trust, 48 Watsons Rd, Harewood, Christchurch. See: <http://www.bush.org.nz/nzern/conference/2006Program.html>

Thanks!

Landcare Research researchers in the Dryland IO are again grateful for the amazingly generous and encouraging assistance we have received. The awareness strategy compiles many of the ideas and experiences of the following helpful people: Paul Millen (Millen Associates), Nicky Eade (Marlborough DC), Penny Wardle (publicity consultant), Aalbert Rebergen (Otago RC), Richard Allibone (QEII), Marian van der Goes (DOC), Jonathan Casbolt (Central Otago DC), Al Shearer (ECan), Kiersten McKinley (DOC), Chris Woolmore (DOC), Phil McGuigan (ECan), Richard Ball (ECan), Bill Simpson (ECan), Andrew Willis (ECan), Louise van der Voort (Central Otago DC), Sam McIvor (Meat & Wool NZ), Craig Pauling (Ngai Tahu, Landcare Research), George Collier (Agfirst Consultants), Matthew Sole (DOC), Simon Moore (DOC), Jeff Flavell (DOC), Chris Ward (DOC), Nick Head (DOC), Greg Bennett (Hurunui DC), Andrew Feierabend (Hurunui DC), Don Ross (Landcare Trust), Miles Giller (QEII), Shelley Washington (Landcare Trust), Frances Schmechel (Landcare Trust), Jodie Denton (Kaikoura DC), Rachel Vaughan (Kaikoura DC), Brian Molloy (QEII), Jan Clayton-Greene (DOC), Colin Davis (DOC), Steve Cranwell (DOC), Tim Porteous (Greater Wellington RC), Marie Taylor (QEII), Campbell Leckie (Hawkes Bay RC), James Reardon (DOC), John Adams (DOC), Alan White (DOC), Sarah Wilson (Down 2 Earth), Mike Peters (NZERN), and Geoff Walls (private contractor), Judy Grindell and Chrys Horn (Landcare Research). Compilation of the document was funded by the Department of Conservation and FRST. Special thanks to Theo Stephens (DOC) for helping initiate and guide this work. For providing sustenance for our hungry databases we thank Aalbert Rebergen (ORC), John Sawyer, Theo Stephens, John Barkla, Mike Thorsen, Clayson Howell, Derek Brown, Simon Moore, Cathy Jones, Jorge Santos, Nicky Robb, Don McLean, John Adams, Andrew Townsend, Gary Foster (DOC), Joe Cartman (CCC), Deborah Emmett, and Peter Bannister (OU). In Landcare Research we thank Craig Briggs, Hazel Broadbent, Peter Bellingham, Nick Spencer, Susan Wisser and Linda Newstrom for patiently responding to our requests for data, databases, and information. Thanks to Nick Prouting and Guy Harris (Landcare Research) who enabled. Again we thank James Reardon and DOC's indefatigable GAOS team for facilitating our work at Macraes, and Marieke Lettink, Chris Jones, Guy Forrester and John Steel for their inputs into the research. Many warmly thank many others who readily shared their ideas, methods, and experience.

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