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NCCARF
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Adaptation Research Network TERRESTRIAL BIODIVERSITY

Terrestrial Research E-bulletin

Convener's Update

July 2012 has seen a ground breaking era in Australia with a price on carbon, and we hope to see the environmental and health benefits of this decision for many years to come. Only time will tell of the implications of this move for Australia but we hope it is the first of many moves to slow the impacts of climate change on Australia's environment and lifestyle.

Network update:

The final round of student funding for the Terrestrial Biodiversity network was awarded in April. Three honours/masters project grants, and six PhD collaborative travel grants, were awarded. To see the reports of all previous grants rounds please go here. The other big network event for this quarter has been a workshop in May in which eminent fire scientists and managers were brought together by NCCARF –TB network in Hobart to discuss the interactions between bushfires, climate change and biodiversity. The experts, from all over Australia and abroad, were asked to identify key threatening processes and to develop an adaptive management framework for fire and biodiversity in Australia under global warming conditions. The workshop participants have produced a brochure outlining the concept of fire countries and highlighting the challenges in the complex fire-, biodiversity- and climate-change nexus, as well as a foundation for an adaptive management framework intended for end-users within fire and land management organisations.

In this edition we feature the last 3 Terrestrial Biodiversity NARP funded projects and provide a summary of what they are hoping to achieve. We also provide the usual updates on conference and must reads.

We hope you enjoy this issue, and if you wish to contribute an article or publication to the next issue please let us know.

Steve Williams & Lesley Hughes

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Meet the Steering Committee

Prof Andrew Lowe

Professor Andrew Lowe is Chair in Plant Conservation Biology and Director of the Australian Centre for Evolutionary Biology and Biodiversity at the University of Adelaide, and Head of Science within the Science Resource Centre for the South Australian Department of Environment and Natural Resources.

Andrew's predominant research interest is 'how do plants survive and adapt to anthropomorphized landscapes?' He leads a group applying ecological and genomic analyses, to understand and develop management strategies for a range of landscapes and ecosystems. Andrew is passionate about communicating science, particularly the threats and solutions to biodiversity pressures.

NARP FUNDING

In 2011, funding outcomes were announced with respect to $4.2million for Climate Change Adaptation Research Grants. Applicants were asked to specifically address the National Adaptation Research Priorities (NARP's), as identified in NARP's for each NCCARF Network. Approximately $2million of this money was awarded to Terrestrial Biodiversity NARP research. In this issue, we present the final three summaries from the successful projects.

Adapted future landscapes – from aspiration to implementation

Wayne Meyer, Adelaide University.

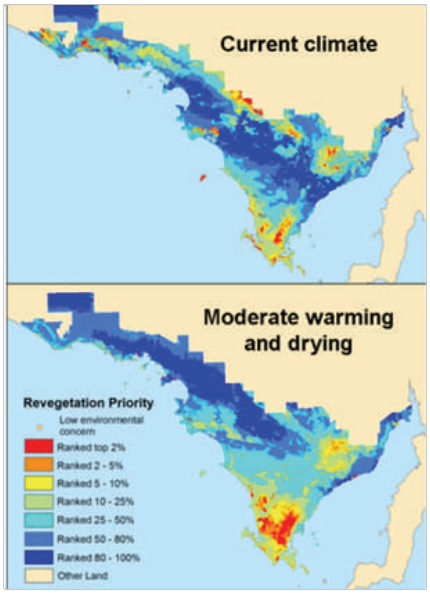
Helping regions in Australia plan and implement changes in the way they use land for food and conservation in the face of changing climate, markets and the interests of communities is important. Previous work has shown that with careful planning it is possible to adapt to changing climate and to develop land use and economic buffers against the uncertainties of markets and costs in the future. To achieve this adaptation and buffering will require change, and hence policy incentives, to guide and encourage what needs to be done.

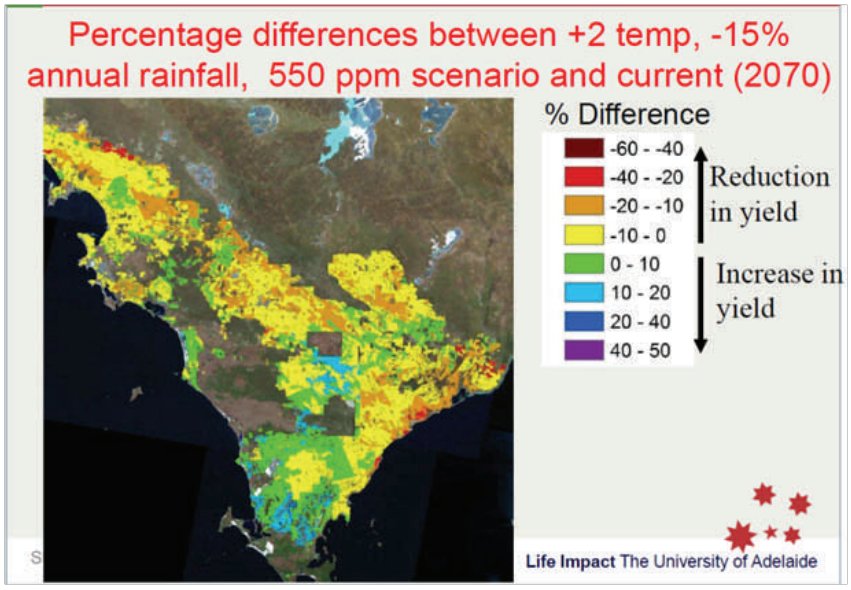
The project team will use organisational change processes to develop a high level of awareness of a regional NRM vision. With this guiding ideal the options for possible future land uses that give the region the best chance of adapting will be identified using computer based outputs. Maps of current resource condition and projections of possible future condition will also be generated.

A new software "tool" is to be developed that will allow NRM staff to pose "what if" questions using regional information and climate change scenarios. Maps will illustrate how the landscape will look and how it will function. Regional decision makers will be more informed about the effects and consequences resulting from planned implementation. They can then more reliably assess which options will be best for their region given the level of bio-physical, social and economic risk they feel comfortable with.

If this process is successful then its application to other NRM regions in Australia is relatively straight forward. This methodology provides a systematic way of gathering and presenting the information of what makes up an NRM region, what the condition of the resources are and what options are possible to guide successful adaptation. It is complementary to and builds on much of the data gathering that is being done.

With a greater emphasis on processes that develop ownership of the regional NRM vision ("what do we want our landscape to look like") there is a much greater chance that regions will have more successful program implementation. The process leads to better evidence based decision making. It also provides a way of tracking more and less successful actions that will assist learning and responsive adaptive management. Regional areas and communities will be more "climate change ready" and have planning and implementation that is adaptive.





Potential distribution of land use in the Eyre Peninsula NRM Region when considering projected changes in endemic vegetation as the climate becomes warmer and drier and modelled change in wheat yields across the region as temperature increases (2 C) gets drier (15% less annual rainfall) and CO_2 has increased from the current 390 ppm to 550 ppm.

The architecture of resilient landscapes

Veronica Doerr, CSIRO Ecosystem Sciences

One of the most cost-effective things we can do to help native species under climate change is to support their inbuilt capacity to cope with environmental change. That inbuilt capacity involves the ability to use different behaviours, grow and develop differently, move to different local microclimates, and make significant range shifts, as well as genetically adapt. All of these processes are more likely to occur in larger, well-connected populations. Thus, the most common approach to climate adaptation for biodiversity that is emerging at national, state and regional levels is designing landscapes for larger, better connected, and thus more resilient populations of native species. However, current design plans are prepared without taking the effects of climate change on land use into consideration. Climate change will result in significant changes to farms and other human-dominated parts of the landscape because they have to adapt to climate change too, and these changes will also affect native species, particularly in terms of the connectivity of landscapes. So how can we design *future* landscapes, not just current landscapes, to support native species?

To find solutions, CSIRO and collaborators from the New South Wales Office of Environment and Heritage and the Queensland University of Technology are modelling a range of plausible future landscapes that incorporate effects of climate on the distributions of native communities as well as changes in land use. We are then overlaying different approaches to landscape design for biodiversity in these future landscapes. Finally, we are using a metapopulation capacity model to estimate the ability of these different designs in different landscapes to support larger populations of key native species groups (and smaller populations of some important invasive species). Our final analyses are then aimed at identifying approaches to designing landscapes for biodiversity that work well across all our plausible future landscapes, and thus represent robust approaches to landscape design for the future even if we don't know precisely what the future will be like.

Two different 'landscape designs'; LEFT - many small areas of native vegetation in between the larger patches, RIGHT - corridors to link the larger patches. Which will be more effective in climate change adaptation?

Optimal habitat protection and restoration for climate adaptation of Australia's threatened species

Richard Fuller, (UQ); with Hugh Possingham (UQ), Brendan Wintle (University of Melbourne) and Martin Taylor (WWF)

Climate change will have major impacts on Australian biodiversity in the coming century. Species distributions and ecosystem compositions will shift drastically and so our conservation actions will need to adapt equally radically. For example, climate change will alter which sites are prioritised for protected area designation and for habitat restoration. We want to move beyond simple predictions of climate change impacts by identifying optimal protection and restoration options for Australia's threatened species.

As a first step, we are modeling the current distributions of Species of National Environmental Significance across Australia using occurrence data at a 1-km resolution extracted from the ANHAT (Australian National Heritage Assessment Tool) database and a modeling technique based on maximum entropy (Maxent). We are modeling distributions using climatic and substrate-related variables, and will then project these into the future under multiple scenarios of climate change.

Using these predictions and two well-established tools for conservation planning - Zonation and Marxan - we will then work out where to place protected areas and to undertake restoration activity to give the greatest benefit to threatened species under a changing climate. Our prioritisation will take into account costs, benefits and likelihoods of success of the different conservation actions. A key innovation of our project is the development of probability surfaces representing the chance a given restoration approach will be successful in a given location. This builds on existing work by the research team in quantifying restoration success probabilities using Bayesian Belief Networks.

When complete, our project will produce, for a given budget, a comprehensive plan for optimal protected area creation and habitat restoration across Australia in the form of spatially explicit time-slice maps of where and when habitat restoration is needed to minimise extinctions from climate change. The results of the project will be communicated through a range of channels, including international and local conferences bringing scientists and decision-makers together, and publications in peer-reviewed journals as well as in plain language magazines such as Decision Point.

Must Read:

Hot off the press— papers and reports on climate change adaptation

- **Climate change as a main driver of ecological research.** (2012) Pettorelli, N. *Journal of Applied Ecology, 49, 542-545*. This interesting review examines the known impacts of climate change on species and systems, and goes on to discuss how best we can use management decisions and actions to mitigate against climate change, and explore what are our best options are for adaptation management. DOI: 10.1111/j.1365-2664.2012.02146.x

- **Biotic interactions influence the projected distribution of a specialist mammal under climate change**. (2012) Bateman, et al. *Diversity and Distributions* (online early). This study, partly funded by an NCCARF student grant, used species distribution models and species interaction data to investigate how climate change, and interactions with competing species, might affect the distribution of the northern bettong in Queensland. DOI: 10.1111/j.1472-4642.2012.00922.x

- **Tracking of climatic niche boundaries under recent climate change**. (2012) La Sorte & Jetz, *Journal of Animal Ecology*, 81, 914-925. The authors use a meta-analysis approach to look at the temporal structure of shifts in bird distributions over the past 34 years. DOI: 10.1111/j.1365-2656.2012.01958.x

Conference Update

15th International River Symposium. 8-11th October, Melbourne, Australia. http://riversymposium.com/

Storm Warning: Water, Energy and Climate Security in a Changing World. Banff, Canada, October 15-19th 2012 http://www.stormwarning2012.ca/index.php/program

2012 International Conference of Biodiversity and Climate Change. Hong Kong, December 29-30th 2012. **Abstracts due 20 August 2012.** http://www.icbcc.org/

OzWater 2013. Perth, Australia, 7-9th May 2013. **Abstracts due 30 August 2012.** http://ozwater.org/

About the Adaptation Research Network for Terrestrial Biodiversity

The Adaptation Research Network for Terrestrial Biodiversity is one of eight Research Networks administered by the National Climate Change Adaptation Research Facility - www.nccarf.edu.au.

It is hosted by James Cook University in Townsville.

Convenors:
Prof. Steve Williams
Ph.: +61 (0)7 4781 5580
stephen.williams@jcu.edu.au

Prof. Lesley Hughes
Ph.: +61 (0)2 9850 8195
lhughes@bio.mq.edu.au

Coordinator:
Dr Yvette Williams
Ph.: +61 (0)7 4781 5552
yvette.williams@jcu.edu.au

TRE Editor:
Dr Jo Isaac
joanne.isaac@jcu.edu.au

Our Website
www.nccarf.jcu.edu.au/terrestrialbiodiversity

To subscribe to our Network - http://nccarf.jcu.edu.au/terrestrialbiodiversity/index.php/register

For more information or to join our Network, please email yvette.williams@jcu.edu.au.

To contribute stories or ideas to TRE, please email joanne.isaac@jcu.edu.au

TB Network Partners