NCCARF PhD Travel Grant Report

Sarah Butler, The University of Queensland

The PhD travel grant was used for travel expenses to Tasmania to collaborate with a number of researchers and managers in the climate change adaptation field, including Dr Louise Gilfedder (DPIEW), Associate Professor Catherine Pickering (Griffith University), Professor Lesley Hughes (Macquarie University) and Richard Thackway (ACEAS TERN). Key people I intended to liaise with were unavailable during my visit due to difficulties within scheduling meetings. Furthermore, I was unable to attend the climate change adaptation workshop due to PhD commitments. However, the travel coincided with the ESA conference in Hobart, allowing me to liaise with key people in the climate change adaptation research field, including Catherine Pickering, Lesley Hughes and Richard Thackway.

Major findings

A major finding during my collaboration with Louise Gilfedder, Catherine Pickering and Lesley Hughes During is the importance of functional traits to exploring climate change adaptation pathways. During meetings we discussed the role of functional traits in climate change adaptation research. We identified that functional traits are currently being used to assess the risk associated with climate change threats, including directly from climate change (altered temperature and rainfall regimes, carbon dioxide levels), and indirectly (increased fires, grazing by feral animals, and weed invasion). Functional traits also allow ecologists to compare risks between different ecosystems and different regions. To date, species level research on climate change adaptation has not been able to generate general models, given the idiosyncratic responses of individual species to temperature, water availability and carbon dioxide levels. Regional assessment of risks to individual species is also inefficient, given the large number of species that may be at risk to climate change pressures. Developing models of functional trait shifts in response to direct and indirect effects of climate change will improve our understanding of how ecosystems may adapt to climate change from which management practices can be improved.

A second major finding from my collaboration with Richard Thackway was the importance of regrowth vegetation to regenerating landscape resilience to climate change in agricultural landscapes. There is 10 million ha of regrowth vegetation in Australia, predominately in agricultural areas, however, not all patches of regrowth are equal in terms of biodiversity and carbon sequestration values. During meetings we discussed the role of regrowth vegetation to regenerating habitat connectivity that improves the capacity of ecosystems to shift spatially and for landscapes to adapt to climate change. We also discussed the role of regrowth as a restoration bargain, given that in many areas regrowth occurs spontaneously with little management intervention (e.g. removing live stock grazing or ceasing tilling the soil). From this discussion we also concluded that there is currently no legislative or policy framework that includes regrowth as a means for mitigating or adapting to climate change.

Major outcomes

A major outcome of the collaboration is the establishment of continued dialogue with Catherine Pickering and Lesley Hughes and my appointment as a Post Doc researching climate change adaptation in plant communities based on functional traits. This position is commencing in early 2012.

A manuscript has also being drafted from my PhD exploring the response of plant functional traits in highly fragmented subtropical woodland to multiple pressures including climate variation, grazing, weed invasion and fragmentation.

A manuscript is currently being drafted providing a framework to include regrowth vegetation in carbon sequestration and biodiversity stewardship policy to assist government agencies with meeting climate change mitigation and adaptation targets.

Significance to adapting and protecting Australia's terrestrial biodiversity

The models that will be provided in published papers during my post doc and from my PhD can be used by managers to prioritize adaptation strategies that build resilience within ecosystems to climate change. Management strategies include restoration to improve landscape connectivity, fire management, weed and feral animal control and managing tourism. Prioritisation can be built around ranking the risk to climate change threats at a functional trait level. Spatial analysis could also be used to identify key refugia. Priority species can also be identified from functional trait analysis so that rehabilitation and ex situ conservation programs can be developed where required. These models can also be specifically applied by managers within the case study areas in Australia, including alpine areas and subtropical woodlands.

The manuscript I am drafting on regrowth vegetation also provides a framework for land managers to define the value of regrowth vegetation for providing biodiversity and carbon sequestration. Prior to the pricing of carbon, vegetation was seen as consumable resource depending on social, economic, political and environmental divers. This is often referred to as market failure, as no market exists for biodiversity services. With the setting of a carbon price, landholders need strategic tools to assist in determining what the best outcomes are for public/private benefit. There needs to be consistent policy frameworks to inform and facilitate this process. The framework provided in this paper can be used all over Australia by land managers at a property, local government, state and federal government level to prioritise resources for managing regrowth vegetation for both carbon and biodiversity benefits.

Future research suggestions

Future research on climate change adaptation needs to incorporate the following lessons to make research directly relevant to managers:

- Methodologies need to be repeatable in different ecosystems and regions, allow comparison and ranking of multiple stressors and provide an assessment of the sensitivity of different components of an ecosystem to individual stressors. Using ecosystem or community functional traits as a response variable may provide an effective and efficient means for achieving this, allowing research and land managers to explore climate change adaption pathways.

- Research needs to occur at multiple scales (patch, landscape and regional scale) such that management outcomes are directly applicable.

- More research needs to occur in fragmented and degraded landscapes, including mature and regrowth/disturbed vegetation, as ecosystems in these landscapes are already threatened by land-use and land clearing. Regrowth vegetation may also provide a cost effective restoration tool with which to build landscape resilience to climate change. However, we need more studies that assess the value of regrowth vegetation for building resilience in fauna and flora populations to climate change.

Research that incorporates these points can feed directly into management planning that prioritizes adaptation strategies to build resilience in landscapes to climate change.

I would like to thank NCCARF for the opportunity to undertake this collaborative travel. Without this funding I would not have been able to draft the two manuscripts identified and may not have had the opportunity to undertake the post doc this year. I have also learnt a significant amount about the current state of climate change adaptation research in terrestrial ecosystems, which has set me on an interesting and meaningful research pathway coming out of my PhD.