



# Terrestrial Research E-bulletin

## Convener's Update

Welcome to the October edition of the TRE-bulletin. The last three months has seen the roll out of the Terrestrial Biodiversity Network national roadshows. These have resulted in very successful networking and work-shopping days in Brisbane and Melbourne and will continue into early next year in the other capital cities. We have frequently been asked at these events if the emphasis on adaptation means that mitigation is no longer an option or of interest. This is certainly not the case and the Network continues to emphasise that a strong stance on both mitigation and adaptation must be taken to minimise the impacts of climate change, not only on terrestrial biodiversity but all sectors.

The network will also be running our third workshop in November, on "Assisted migration, preparing for climate change: moving who, when, where, how and why?" The workshop will take place in York, W.A., from the 15-19th November. A summary from the workshop will be in the January TRE-bulletin.

On more globally relevant issues, 2000 to 2009 has been the hottest decade in recorded history (that is since 1880) with 2010 now tied (so far) with 1998 as the hottest year on record. The variability that we see globally, however, has led to skepticism about the importance of addressing climate change as a world-wide issue. To help explain answers to many of the skeptics' questions that are still regularly covered in the media, the Australian Academy of Science has released a report: 'The science of Climate Change: Questions and Answers'. This can be downloaded as a pdf from:

<http://hosting2.arcs.org.au/terrestrialbiodiversity/index.php/General/the-science-of-climate-change-questions-and-answers.html>. This is a great resource and a



simplified way of explaining the issues.

In this issue we focus on adaptation research underway in Victoria, in the Alpine region and on bird migration. In addition to the usual 'Must Reads' and 'Conference Update' sections, we also report on a recent review on how our tropical forests are likely to adapt to climate change.

We hope you enjoy this issue and we will be back again in January 2011 with more network news.

**Steve Williams & Lesley Hughes**

### DON'T MISS

**Heller and Zavaleta, Biological Conservation.**

This paper lists 16 recommendations for climate change adaptation strategies assembled from 112 scholarly articles over the last 22 years.

Download it [HERE](#)

### Meet the Steering Committee

#### Dr Dick Williams

Dick is a plant ecologist based in the Tropical Ecosystems Research Centre, at CSIRO in Darwin.



He is primarily interested in plant community dynamics and the ecology

and management of fires in tropical savannas, alpine grasslands and heathlands .

Dick has published extensively on the impacts of fire on plant biodiversity and his current research focuses on interactions between climate change, fire regimes and biodiversity. He is chair of a Scientific Advisory Panel advising Parks Victoria, and is on the Editorial Board of the *International Journal of Wildland Fire and Plant Ecology*.

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# Focus on Victoria

The climate change fingerprint is clearly evident in Australia's smallest mainland state, Victoria. 1998-2007 was the hottest decade on record, and mean annual temperature in 2007 was 1.2°C above the long-term average. Victoria is expected to see further increases in mean temperature, sea level rise, declining rainfall and an increased risk of bushfire.

A decline in snow fall and cover in the Alpine region, and an increase in the frequency, severity and extent of wildfire are expected to have the most negative impacts on terrestrial biodiversity. Here, we highlight some of the groundbreaking work taking place on climate change impacts and adaptation in the Garden State.

## Climate Change and the Victorian Alps

by Ary Hoffmann, Ian Mansburgh & Henrick Wahren

Victoria has a long history of developing innovative management policies related to biodiversity, and adaptation to climate change is a key emerging issue soliciting policy responses and scientific potentials.

Under climate change, snow country is projected to shrink, making the Australian Alps a key area for research that will inform management. In 2002, Victoria supported Melbourne and LaTrobe Universities in a successful bid for an ARC Linkage grant to join the International Tundra Experiment (ITEX). As well as extending ITEX into genetics and elements of soil carbon sequestration, Victorian researchers have also identified changing patterns of phenology in alpine plants.

Six common sub-alpine species (grasses, sedges, shrubs and forbs) were chosen for observations over five years in the Bogong High Plains. ITEX plots mimic warmer climatic conditions in terms of both internal air temperatures and soil temperatures.

The main aims of the study were to assess if warmer climatic conditions lead to phenological changes in subalpine plants and how changes vary across species. These factors are important in assessing the likely future of Australia's alpine ecosystems under climate change, as shifts in phenology can influence the fitness of plants directly and indirectly.



**A researcher examines an Australian ITEX plot in the Alps (© ITEX)**

For example, plants that develop early might not survive if conditions for seedling growth aren't ideal, or there could be mis-match between plants and their pollinators.

Results show that phenological changes, particularly flowering, occurred earlier in response to warming in all species. However, while some species took 2 to 4 years before changes were evident, others responded immediately. Some species also seemed able to compensate to some degree.

The interactions of these species could shift the balance of Australian alpine ecosystems over time. Species better able to adapt to warmer, drier conditions may well overtake those less capable of such responses.

## Bird Migration Sends Mixed Message

Climate change has been linked extensively to shifts in the timing of bird migration in the northern hemisphere with many birds migrating earlier in spring and later in autumn. But, partly due to a lack of available long-term data collection, the impacts of climate change on migration patterns in Australian birds is relatively unknown.

In a bid to address this gap in our knowledge, Steering Committee member Lynda Chambers, from the Bureau of Meteorology in Melbourne, recently examined 21 years of bird migration and climatic data from a peri-urban environment near Melbourne.

She found that a quarter of the species studied had altered their arrival time over the study period, while more than a third had altered their time of departure. However, while some species did fit the expected pattern of an earlier arrival and later departure time, some demonstrated the opposite patterns. Lynda also found that the timing of avian migration was most clearly related to minimum temperature, compared to other climatic variables such as maximum temperature and rainfall.



**The Eastern Yellow Robin is arriving later and leaving earlier than it did two decades ago. (© LE Chambers).**

Lynda hopes that the study will stimulate more extensive research in this area, as it has important implications for the adaptation of migratory species under climate change. "Even small shifts in the timing of migration could result in a mismatch between bird breeding and food availability for raising chicks," she explains. Management of key species is also likely to be complex. "The responses shown by these species to changes in climate indicate that it may not be straightforward to predict shifts in seasonal timing of individuals or populations in response to climatic shifts," Lynda points out. Most importantly, in terms of adaptation management, the study highlights the need to monitor bird populations. "Given climatic projections of more pronounced warming and drying for this region in Victoria, we will need to monitor bird populations continually to determine if species respond predominantly to inter-annual variability in climate or to, as yet unknown, climatic thresholds," Lynda concludes.

\*Chambers, LE. (2010) *Emu*, 110, 48-53.  
Get Involved: <http://www.climatewatch.org.au>

# Adapting to the likely impacts of climate change on our tropical forests

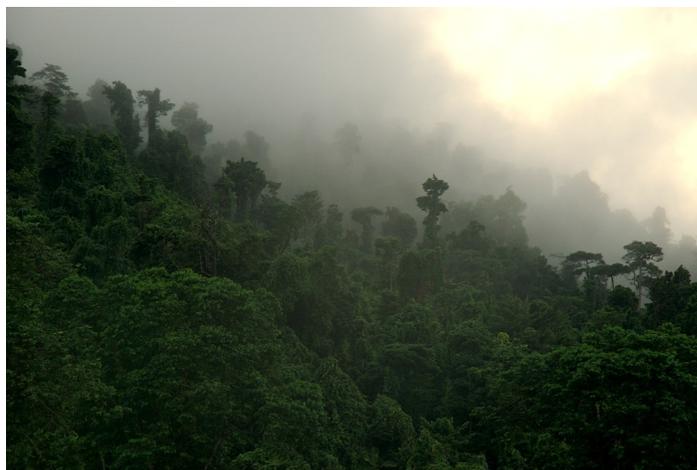
by Robyn Wilson, Forest Vulnerability Assessment, NCCARF Project

Australia's tropical forests are limited in extent but form an important part of the landscape. They are valued for their aesthetic, timber, biodiversity benefits, and role in ecosystem services such as stabilizing soil. They are also habitat for a vast array of insects and mammals many of which are important in pollination and nutrient recycling, and social and economic benefits. However, they have been identified by the IPCC as a resource under threat from climate change. In much of Australia, forests are already stressed by lack of water availability, rising salinity, infestation of pests and disease, and fragmentation and edge effects caused by infrastructure such as roads.

Climate models indicate that our tropical forests will be exposed to conditions outside those experienced by species today e.g. increased seasonality, extreme events, longer dry season, more extreme rainfall events in summer, and an increase in temperature of 2 – 3 ° C. To cope with these changes adaptation will be required.

We explored the future of Australia's tropical native forests under the likely effects of climate change both with and without adaptation during a workshop with experts from Government and NGO's involved in forestry management and policy. With no adaptation, there will likely be big species losses, plant community composition will change, and the forest values outlined above will be reduced, resulting in a decline in resilience and higher exposure to pests and disease. In northern Australia increased urbanization and competing land uses, along with loss of native forest in southern states will increase pressure to clear what forest is left.

However, with adaptation native forest and woodlands may increase in area. Adaptation will require us to stop attempting to recreate the past and accept change; grasslands are allowed to be replaced with woodlands on abandoned agricultural land enabling vegetation thickening, reforestation and/or regeneration. The forestry focus will need to shift from timber to climate regulation, water pump, soil stability, carbon-sequestration, amenity, catchments, biodiversity, and well managed timber. Respondents also suggested ecosystem management may require species selection and translocation of species.



**Adaptation measures could help save, and even expand, our tropical forests under climate change (© Gary Wilson).**

## Must Read

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

- ◆ **Complex responses to climate drivers in onset of spring flowering across a semi-arid elevation gradient.** (2010) Crimmins et al. *Journal of Ecology*. 98, 1042-1051.



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Using a 20-year data set to examine the roll of rainfall in flowering phenology in an arid region of south-western USA, this study indicates that triggers for the onset of flowering differ at high and low altitude. The authors also document a delay in flowering in 10% of their study species over the study period, and suggest this is related to reduced rainfall. DOI: 10.1111/j.1365-2745.2010.01696.x

- ◆ **Here on Earth– An Argument for Hope, By Tim Flannery.**

Flannery's first book since 'The Weather Makers', 'Here On Earth' charts the rise of human civilization and discusses how we can use our success at mastering technology and science to save the planet. Published by Penguin on September 27th 2010: <http://www.penguin.com.au/products/9781921656668/here-earth-argument-hope>

- ◆ **Coupled dynamics of body mass and population growth in response to environmental change.** (2010). Ozgul et al. *Nature*, 466, 482-485.

Employing new methodology, the study investigates the link between climate change, demography and life history in the yellow bellied marmot over a 30 year period. Results indicate in response to warming conditions, marmots emerge earlier from hibernation and wean young sooner, leading to a longer growth season and higher body mass at hibernation—resulting in a significant increase in population size. DOI: 10.1038/nature09210.

- ◆ **Vulnerability of Tasmania's Natural Environment to Climate Change: An Overview.**

(2010) Department of Primary Industries, Parks, Water and Environment.

This report assesses the vulnerability of Tasmania's terrestrial, freshwater and ocean biodiversity to predicted climatic changes. The report indicates alpine regions will be at risk in the future. <http://www.dpiw.tas.gov.au/inter.nsf/WebPages/DRAR-88P8CY?open>

# The Adaptation Research Network for Terrestrial Biodiversity—On the Road

The Adaptation Research Network for Terrestrial Biodiversity is delighted to have commenced its series of Roadshows, with the inaugural roadshow taking place in Brisbane on September 14<sup>th</sup>, and a second held in Melbourne on October 5<sup>th</sup>.

The primary aim of the Roadshows is to increase the interaction between our network and local stakeholder groups, such as management agencies, policy makers and local government, in order to identify their specific research needs and major challenges to climate change adaptation for protecting natural ecosystems.

The roadshows consist of a one day workshop in each of the network nodes across Australia, including talks on climate change adaptation issues from a variety of individuals and groups working in research, management and policy. Each workshop will aim to identify the most significant local research needs and challenges and help put these into a national context.

The first Roadshows in Brisbane and Melbourne were attended by 62 and 48 participants, respectively, from all sectors. Network co-ordinator Dr Yvette Williams says "The first roadshows in Brisbane and Melbourne were very successful networking and work-shopping days." Presentations and information given and collected on the day are available on our website.

The Roadshow workshops will be held in all states and territories over the next 12 months and anyone wishing to attend is more than welcome.

**Western Australia:** 11 November, Curtin University of Technology, Perth.

**ACT:** 8th December, CSIRO Discovery Centre, Canberra.

Please visit <http://hosting2.arcs.org.au/terrestrialbiodiversity/index.php/roadshows.html> for dates for other states as they are confirmed, and updates and information on the content, scope and presenters for roadshows in each state.



## 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](http://www.nccarf.edu.au).

It is hosted by James Cook University in Townsville.



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To contribute stories or ideas to TRE, please email [joanne.isaac@jcu.edu.au](mailto:joanne.isaac@jcu.edu.au)

## Conference Update



Ecoforum. Conference and exhibition. Australian Technology Park Sydney. 9-11 March 2011. Abstract submission closed. <http://www.ecoforum.net.au/2011/default.asp>

Resilience 2011. Resilience, Innovation and Sustainability: Navigating the Complexities of Global Change. Second International Science and Policy Conference, Tempe, Arizona, USA. 22-16 March, 2011. **Abstract submission open.** Details: <http://resilience2011.org>

The 8th IALE World Congress. Landscape Ecology for Sustainable Environment and Culture. Beijing, China. 18-23 August, 2011. **Abstract submission open.** Details: <http://www.iale2011.org>

Greenhouse 2011. The science of climate change. Cairns Convention Centre, Queensland. 4-8 April 2011. Abstracts submission closes 19th November <http://www.greenhouse2011.com/submissions>

## TB Network Partners



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