HAZARD **NOTE**

bushfire&natural **HAZARDS** CRC

RESEARCH FOR BETTER LAND MANAGEMENT

ABOUT THESE PROJECTS

This is an overview of the *Prescribed burning and catchment management* cluster of Bushfire and Natural Hazards CRC projects.

1. **Optimisation of fuel reduction burning regimes for fuel reduction, carbon, water and vegetation outcomes** – A/Prof Tina Bell, Prof Mark Adams, Dr Tom Buckley, Dr Mana Gharun, Ariana Iaconis, Maggie Norton, Dr Malcolm Possell and Dr Tarryn Turnbull, University of Sydney. Contact tina.bell@sydney.edu.au

2. **Savanna fire management for north Australia** – Adj Prof Jeremy Russell-Smith, Dr Andrew Edwards, Dr Samantha Setterfield, Dr Natalie Rossiter-Rachor, Cameron Yates and Kate van Wezel, Charles Darwin University. Contact jeremy.russell-smith@cdu.edu.au

3. **From hectares to tailor-made solutions for risk management** – Prof Ross Bradstock, Michael Bedward, Bronwyn Horsey, Dr Owen Price, University of Wollongong, Dr Matthias Boer, Dr Luke Collins, Western Sydney University, Dr Trent Penman, University of Melbourne, Hamish Clarke, Office of the Environment and Heritage NSW. Contact rossb@uow.edu.au

CONTEXT

Public and professional expectations of fire agencies and land managers have risen considerably and a greater, more transparent understanding of the trade-offs involved in the management of landscape fire and prescribed burning is required. Tools that standardise risk assessment across different vegetation types, management objectives, agencies and communities are useful to ensure threats are recognised and treated in the same way.

OPTIMISATION OF BURNING REGIMES FOR FUEL REDUCTION, CARBON, WATER AND VEGETATION OUTCOMES

BACKGROUND

This project focuses on improving the capability of land managers to use prescribed fire to reduce fuel loads, while at the same time mitigating the risks of loss of water yield and carbon sequestration capacity.

Two underlying problems have shaped the direction of the study:

1. Limited knowledge of the water storage capacity and dynamics of soil profiles.
2. Limited knowledge of the effects of differing fire intensities on soil carbon.

The study is testing the effectiveness of prescribed burns of different sizes in terms of fuel reduction and impacts on carbon, water and biodiversity.

RESEARCH ACTIVITY

Sampling has been undertaken in sites in mixed-species eucalypt forest in southern Victoria, the ACT and western and southern NSW. This sampling will determine the effect of prescribed fire on changes in fuel load, carbon pools and tree water use.

The sampling scheme investigates 'burn units' – pairs of sites that have been measured and compared. The pair of sites can be burnt and unburnt areas near each other, sampled at the same time, or are a single site sampled at different times before and after prescribed burning. Nearly 50 burn units have been sampled across south eastern Australia. The data collected has been used to test if environmental variability is adequately captured for measurements made at different spatial scales and if fire size affects the optimal number of samples required for characterising burnt and unburnt areas.

RESEARCH OUTCOMES

A literature review has been completed reviewing current modelling frameworks to optimise prescribed fires for both risk mitigation of fuel loads and environmental outcomes. From

▲ **Above:** ACT PARKS AND CONVERSATION SERVICE STAFF MEASURING COARSE WOODY DEBRIS BEFORE A BURN IN THE COTTER CATCHMENT. PHOTO: UNIVERSITY OF SYDNEY.

this review, the research team has proposed a model for optimisation of prescribed burning. The model has two modules; one based on current scientific knowledge and technical experience, and the second based on knowledge gaps in operational and ecological issues. The model could be added to an existing spatial decision support system to provide land managers with a detailed product for exploring and optimising management outcomes in terms of managing effects of fuel reduction on carbon, water and vegetation.

Analysis of data from Victoria and the ACT has found that variation in fuel and soil properties was not as affected by the scale at which measurements were collected in burnt areas than in unburnt areas. Prescribed burning introduces discontinuity to vegetation and soil properties so that a larger number of samples is required in burnt areas than in unburnt areas. However, the variability across burnt areas is smaller in large burns than in small burns. It has also been found that sampling in spatially separate burnt and unburnt plots is comparable to sampling the same plot before and after a fire, and that large prescribed burns (more than 2500 hectares) generally require fewer samples to capture variability across the landscape than small prescribed burns (around 500-1000 hectares).

SAVANNA FIRE MANAGEMENT FOR NORTH AUSTRALIA

BACKGROUND

Australia's tropical savannas are extremely fire-prone – approximately 20% of the savanna region (which covers a quarter of Australia) is currently burnt each year. Annual fire occurrence is particularly frequent across the higher rainfall (more than 1000mm) far northern regions, mostly by severe late dry season fires. The current pattern of late dry season fires impacts on a broad range issues, including community safety and health, production (e.g. pastoral enterprise) and environmental (e.g. soil erosion, stream health, biodiversity, greenhouse gas emissions) values.

This project is:

- Describing environmental risks and providing mapping tools for remote community planning purposes.
- Quantifying the risks posed by flammable exotic grasses (e,g, gamba and mission grasses).
- Exploring fire management challenges in the Gulf of Carpentaria region near the Northern Territory and Queensland border.

RESEARCH ACTIVITY

To date, the team has developed and refined a fire severity mapping algorithm, building upon existing satellite derived modelling and fire history mapping to assess the risk of fire to biodiversity, emissions and ecosystem services. The 2014 northern Australia fire season was assessed using this method, and then compared with the 15-year average, from 2000 to 2014. Finer scale fire mapping analysis has been undertaken around two remote Top End communities; Gunbalanya and Ngukurr. This has included workshops with Indigenous ranger groups to establish the use of existing mapping products

▲ **Above:** RESEARCH IS ASSESSING FIRE SEVERITY AT DIFFERENT TIMES OF THE DRY SEASON IN THE NORTHERN SAVANNAS. PHOTO: BILL MCLEOD, BUSHFIRES NT.

and assess community governance issues affecting resilience in the face of recurring natural hazards (cyclones, floods, savanna fires).

Team members have also visited the Indigenous communities of Borroloola and Robinson River in the Gulf region around the Northern Territory and Queensland border to discuss associated research with key local community members.

RESEARCH OUTCOMES

It was found that the 2014 northern Australia fire season was above average,

END USER STATEMENT

The fuel reduction burning research will improve the efficacy of prescribed burning programs by providing more evidence on the impact of burning on biodiversity, surface and groundwater quality and quantity, and carbon sequestration.

Burn program planners and managers are seeking better tools for forecasting the impact of burn programs on the capacity of the soils to deliver the environmental services required. These tools are efficient survey designs and sampling techniques that are integrated with new predictive spatial models. The application of these tools will give fire management agencies more confidence when assessing the cumulative environmental cost and benefits of the burn programs they propose.

– Max Beukers, Fire and Incident Management, Office of Environment and Heritage NSW

with 41% of the higher rainfall (more than 1000mm), and 27% of the lower rainfall (600-999mm) areas burnt. Across the whole area, 35% of fires were classified as severe (affecting the upper canopy of trees).

Compared with the 15-year average, this was the largest fire season by area burnt in the higher rainfall area, and the 10th largest in the lower rainfall area. There is a notable change in the ratio of early dry season to late dry season fires since 2010 in Western Australia and the Northern Territory, potentially indicating a change in fire management practices. Both jurisdictions have seen an increase in the proportion of the landscape affected by early dry season fires and a decrease in the proportion of late dry season fires, but notably, there has been a decline in the proportion of the landscape affected by fire overall. This is so far not evident in Queensland.

FROM HECTARES TO TAILOR-MADE SOLUTIONS FOR RISK MANAGEMENT

This project has only recently begun. It aims to develop a prescribed burning atlas for southern Australia to guide implementation of 'tailor-made' prescribed burning strategies in different regions.

Bushfire and Natural Hazards CRC
Level 1/340
Albert Street
East Melbourne
VIC 3002
www.bnhcrc.com.au