

# PLANNED BURN MAPPING IN VICTORIA USING REMOTE SENSING



Glenn Newnham<sup>1,4</sup>, Nicholas Bauer<sup>2,4</sup>, Andrew Mellor<sup>2,4</sup>, Anders Siggins<sup>1</sup>, Thomas Duff<sup>3,4</sup>, Lyndsey Wright<sup>4</sup>

<sup>1</sup> CSIRO Land and Water <sup>2</sup> Victorian Government Department of Environment, Land, Water and Planning <sup>3</sup> Department of Ecosystem and Forest Sciences, Melbourne University <sup>4</sup> Bushfire and Natural Hazards CRC

**THE VICTORIAN GOVERNMENT IS COMMITTED TO EXPANDING ITS FUEL MANAGEMENT PROGRAM, AND TO REPORT ON THE EFFECTIVENESS OF PLANNED BURNING AND REDUCING BUSHFIRE RISK. THE DEPARTMENT OF ENVIRONMENT, LAND, WATER AND PRIMARY INDUSTRIES (DELWP) HAS IDENTIFIED THE NEED TO IMPROVE CURRENT APPROACHES TO BURN EXTENT AND SEVERITY MAPPING. THIS PROJECT WILL EXPLORE IMPROVED REMOTE SENSING AND FIELD DATA METHODS FOR CAPTURING, ANALYSING AND REPORTING ON BURN EXTENT AND SEVERITY.**



Figure 1: Controlled burning at Lillimur, Victoria (DELWP, 2007)

## BACKGROUND

The Victorian Government Department of Environment, Land, Water and Primary Industries (DELWP) is responsible for developing standards and processes to support bushfire management on public land. These outline the use of a risk-based approach to bushfire management, and the obligation to report annually on bushfire management activities. The data that underpins this reporting is also required as feedback for staff who manage planned burning and to support risk modelling.

Currently, DELWP uses a number of approaches to collect data on the effectiveness of fuel management. These include:

- fire perimeter GPS surveys;
- ground-based observations and sampling;
- semi-automated satellite image interpretation;
- manual interpretation of high resolution aerial photography.

Planned burns are often of low intensity, patchy in their extent and can result in varying levels of fuel reduction across the burn. The ability to assess changes to fuels beneath forest canopies is a significant challenge in the development of automated remote sensing methods. A recent review of remote sensing technologies has identified the possibility of addressing such limitations and developing a consistent protocol for mapping the effect of planned burns across the state.

This four year research project will develop a generic approach for mapping fuel changes as a result of planned burning across Victoria using remote sensing technologies. The project will include the development of recommendations for field survey methods that will be the basis for calibration and validation of these map products.

## THE PROJECT

The project will evaluate existing methods currently employed within DELWP for both field and remote sensing based assessment of burn extent and severity. Historical data will also be utilised for post-hoc testing, such as:

- Field survey datasets;
- Burnt-area extent maps;
- Burn severity maps;
- Raw remotely sensed imagery.

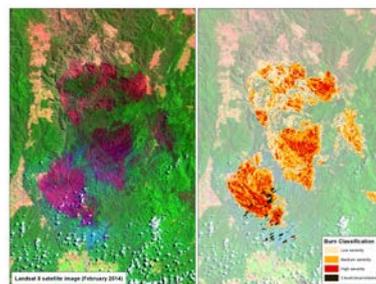


Figure 2: Burn severity mapping using Landsat Imagery (DELWP, 2014)

The two focus studies will also be carried out at specific planned burns during the life of the project. The objective of these studies will be to test the value of enhanced field data collection methods and a broader range of remote sensing data types. Priorities for additional field survey measurements over and above DELWP standard procedure are likely to include:

- Increasing plot sampling density;
- Increasing sampling area;
- Additional measurement approaches within existing plots.

Recommendations for changing existing procedures for field based assessment of burn severity will focus on increasing the value of the data for calibration and validation of remote sensing based mapping.

Purpose built image processing tools will be built to accommodate different remote sensing products. This will ensure estimates of burn extent and severity are of known accuracy. In some cases remote sensing data may be of limited value to determine changes in fuels. In these cases both extrapolation of field data and modelling of fire intensity will also be incorporated into output maps.

## OUTCOMES

The key deliverables for this project will be the user guides and software tools used to produce burn extent and severity mapping products. Specifically the project will ultimately deliver:

1. A user guide outlining recommendations for the design of field surveys to assess planned burns in different landscapes and fuel types in Victoria;
2. Software used for processing remote sensing images to derive planned burn extent/severity maps.
3. A user guide that describes the selection of appropriate remote sensing data, pre-image processing steps and the generation of burn extent/severity maps;

These outputs will be used by DELWP to guide the capture of remotely sensed images and field data in the future. Risked based data on burn characteristics and as an input to risk based assessments of fuel management effectiveness. Such assessments will increase DELWP's ability to understand and objectively report on planned burn effectiveness, and better model predicted bushfire risk. The mapping will also help to provide timely feedback to operational staff about the characteristics and outcomes of their planned burning activities.

