DISASTER LANDSCAPE ATTRIBUTION MONITORING CHANGES IN BURNT UNDERSTOREY USING TERRESTRIAL LASER SCANNING

bushfire&natural HAZARDSCRC

Gupta, V.[1,2]

[1] School of Mathematical and Geospatial Science, RMIT University, Victoria
[2] Supervisors: Reinke, K. & Jones, S. School of Mathematical and Geospatial Sciences, RMIT University, Melbourne, Victoria

THIS RESEARCH MONITORS CHANGES IN UNDERSTOREY FUEL HAZARDS FOR UP TO 2 YEARS POST-BURN USING TERRESTRIAL LASER SCANNING. THIS PROVIDES QUANTITATIVE ESTIMATES OF FIRE IMPACT ON THE LANDSCAPE INCLUDING IMMEDIATE FIRE EFFECTS, POST-BURN FUEL ACCUMULATION AND PRESCRIBED BURN EFFECTIVENESS.

BACKGROUND

Many fire-prone countries mitigate the threat of wildfires through the use of prescribed burns (Figure 1). The measurement of fuel hazards and fire severity are typically conducted using visual assessments, which are both subjective and qualitative. Terrestrial Laser Scanning (TLS) offers opportunities for repeatable, robust and high-accuracy assessment datasets that can supplement qualitative assessments of change in the landscape in response to prescribed burns.

Figure 1. Prescribed burn being carried out in the study area.

METHOD

Study Area

The study area was located in St Andrews (Victoria, Australia). Plots of 10m radius were selected in a dry sclerophyll forest with a grassy understorey. One plot received a fire treatment and was Fire Affected (FA plot) while the second plot was left unburnt (control plot).

TLS data capture and processing

TLS scans were obtained at three different time epochs; pre-burn, two weeks post-burn and two years post-burn. Figure 2 provides an example of the type of effects observed before and after the burn. The TLS data was collected and processed as described in Gupta et al. (2015). TLS-derived metrics were used to characterise change within the plots for three different time combinations. Each time combination represents different information about the burnt landscape. Time combinations included:

Figure 2. Pre- and post-burn effects in the forest understorey.

- *T1*: Pre-burn vs 2 weeks post-burn (immediate fire effects)
- *T2*: 2 weeks post-burn vs 2 years post-burn (fuel hazard accumulation)
- *T3*: Pre-burn vs 2 years post-burn (prescribed burn effectiveness)

KEY RESULTS AND FINDINGS

Figure 3 shows the distribution of changes in a height-based TLS metric. The curves for the control plot remain normally distributed and indicate small fluctuations over time. FA plot shows distinct differences between each of the respective time epochs. The flat curve for T1 is indicative of burnt understorey. For *T2* the FA plot curve moves closer to the control plot curve indicating fuel accumulation. At *T3* the peak of the FA plot curve is between 0.4-0.5 representing understorey vegetation recovery but below pre-burn levels.

The spatial distribution of change in Figure 4 indicates that less than 6% of the control plot shows any change across all time epochs. In contrast, the patchiness of fire effects in the FA plot is clearly evident. In *T1* the FA plot maps the reduction in fuel at ~45% of the total area. Small areas of increase exist due to branch and leaf fall caused by canopy scorching. At *T2* there is evidence of fuel accumulation across ~34% of the total area. However, the longer term effects of the burn are still observed with ~40% of the total area showing fuel hazards remaining at lower amounts than the pre-burn amounts.

Figure 3. Histogram of voxels for a height-based TLS metric.

Figure 4. Spatial distribution of change using a height-based TLS metric.

ACKNOWLEDGEMENTS

Shane Van der Bourne (DELWP) for assistance with fire treatments in the study area.

REFERENCE

Gupta, V., Reinke, K., Jones, S., Wallace, L., Holden, Lucas. Assessing metrics for estimating fire induced change in the forest understorey structure using Terrestrial Laser Scanning. *Remote Sensing* **7**, 8180-8201 (2015).

Australian Government Department of Industry and Science | Business Cooperative Research Centres Programme