Mapping of Planned Burns

Prospects for automated mapping of burned area and severity

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The Victorian Government is committed to objective reporting of fuel management activities in terms of their effect on bushfire risk. The most significant method for fuel management is through planned burning. Determining impacts of these burns on bushfire risk requires efficient, objective and repeatable methods to map burned area and severity. This project is investigating methods to improve the efficiency of planned burn mapping using a combination of field survey and remote sensing methods.

A recommendation of the 2009 Bushfires Royal Commission was an increase in the level of fuel management across the state of Victoria. The most significant and effective method for fuel management employed by DELWP is through planned burns. These burns are often of low intensity, patchy in their extent and can result in varying levels of fuel reduction across the burn. This makes assessing the impact of planned burns on residual risk difficult.

The current best practice for assessing planned burn area and severity is through manual delineation of high resolution airborne imagery. This requires expert knowledge and significant resourcing, both of which are not always available in some DELWP regions.

This project has investigated the basis which underpins successful manual delineation of burn severity classes. Analysis of airborne (ADS80) and satellite (Landsat) image bands showed no unambiguous separation of classes based on spectral reflectance. It was also found that burn severity separability was low for spectral and textural indices derived from these raw image bands.

Due to the lack of separability between classes, conventional statistical classification (supervised or unsupervised) of imagery tend to produce unpredictable results. Often classes are overly fragmented across the landscape.

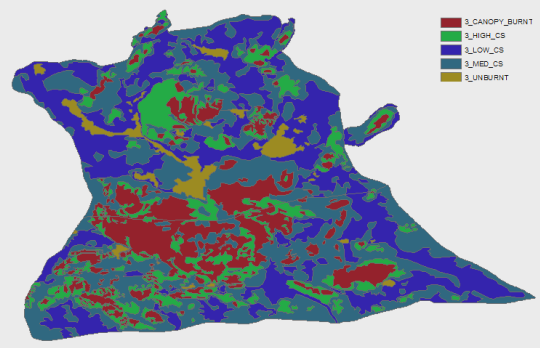

Figure 1: Manual delineation of burn severity classes based on high resolution airborne imagery.

Wildfire mapping methods developed in the USA have shown that imagery collected prior and post-burn can help to show change attributed to burn severity. However, given the high resolution data required for low intensity planned burns, it is often difficult to schedule image acquisition prior to a burn.

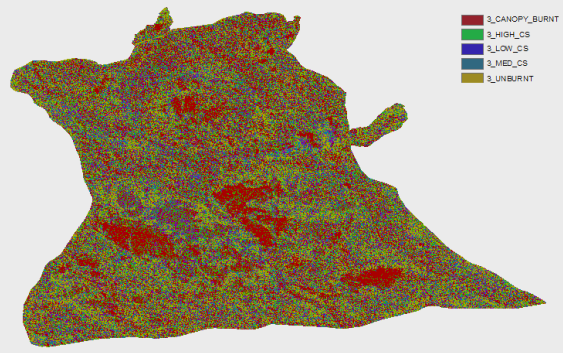

Figure 2: Conventional statistical classification of Landsat imagery into 5 burn severity classes.

One method being investigated for operational mapping of planned burns is a hybrid technique utilising image segmentation and manual interpretation. As a first step, multispectral imagery of low resolution is used to segment the image into consistent spectral and textural regions. These segments can then be overlayed on high resolution aerial imagery for manual attribution of severity classes.

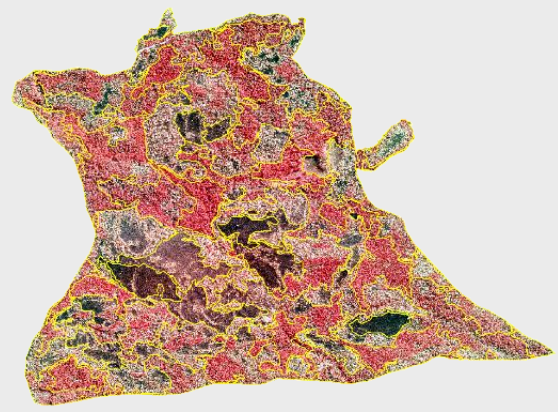

Figure 3: Implementation of the Super Iterative Linear Clustering (SLIC) segmentation method applied to the high resolution aerial imagery to delineate homogeneous areas prior to burn severity attribution.

The segmentation-attribution hybrid mapping approach still requires significant skill in the attribution phase. However, it removes much of the time consuming manual delineation of homogeneous burn class regions.

Our current goals are to work with experts in the Department to determine how effective segmentation is across different risk landscapes, if the hybrid approach can reduce the time required for mapping burn severity and how these methods might be implemented in software that is simple and stable for end-users

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