FUELS3D: WHAT'S THE POINT?

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THE FUELS3D APP PROVIDES A LOW COST DATA COLLECTION METHOD FOR ESTIMATING FUEL HAZARD METRICS. TESTING OF THE APP HAS DEMONSTRATED THAT IT PROVIDES SIGNIFICANTLY GREATER REPEATABILITY AND IMPROVED QUANTIFICATION OF METRICS THAN VISUAL ASSESSMENTS.

ESTIMATING FUEL HAZARD WITH FUELS3D

The Overall Fuel Hazard Assessment Guide (OFHAG) provides an excellent resource and reference for monitoring fuel hazard across south-east Australian landscapes.

Assessment of vegetation attributes such as cover, height and proportion live/dead, that are used to calculate hazard rating of a plot is achieved visually. Visual assessments such as these provide only qualitative information on some metrics and have been demonstrated within the literature to be subjective, meaning assessments are often not repeatable.

The Fuels3D app (Figure 1) has been developed to provide a low cost, and repeatable method to collect fuel hazard information.

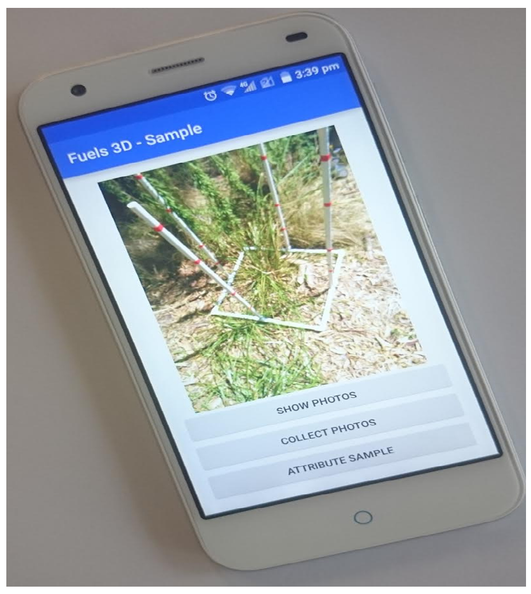


Figure 1 – The Fuels3D android app in action.

Fuels3D utilizes images captured on a smartphone and computer vision algorithms to provide a 3D representation of the fuel structure. From the resultant point cloud, representation of structural metrics such as height and cover can be extracted for use in conjunction with the OFHAG in assessing the hazard present in a landscape.

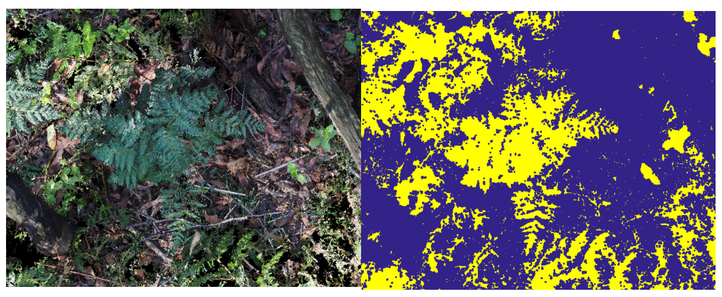
KEY ADVANTAGES OF FUELS3D

- Minimal in-field requirements,
- Minimal expertise requirements
- Repeatable and quantified metrics

FUEL HAZARD METRICS

Metrics are derived by segmenting the point cloud into terrain and fuel layers' points from which above ground height, cover and other vegetation structural measures can be derived. Estimates of live/dead are made based on the spectral properties of the point cloud. Figure 2 shows an example how near surface fuel hazard metrics are represented within a Fuels3D point cloud.

a)



b)

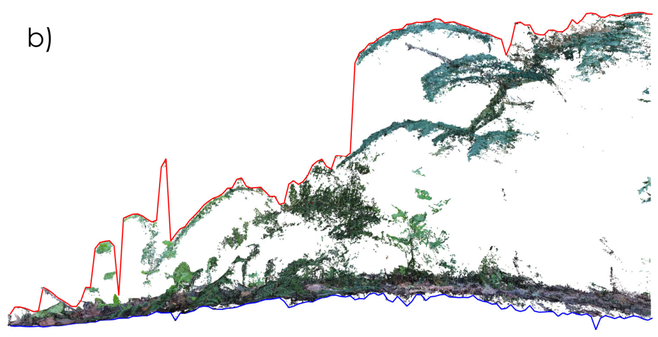


Figure 2 – a) The derivation of near surface cover (shown in yellow) from an orthophoto generated from a Fuels3D point cloud and b) Example of the derivation of near surface height as the difference between the red and blue lines from a Fuels3D point cloud.

REPEATABILITY

Field days were held with 16 personnel from Australian agencies who routinely assess fuel hazard. Working in teams of two, participants assessed plots using the OFHAG and collected data using Fuels3D.

The results of this trial, as presented in Spits et al. (2017), show that the metrics collected using Fuels3D may result in a more precise assessment of surface and near surface fuel hazard. This is demonstrated in figure 3.

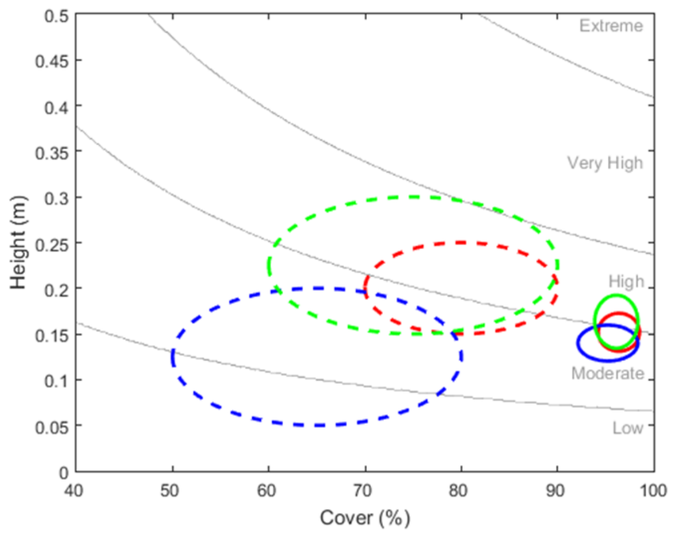


Figure 3 – Range of surface fuel hazard ratings across three plots as assessed visually (dashed lines) and using Fuels3D metrics (solid lines) (Spits et al., 2017).

ACCURACY

The results from the inter-comparison between visual assessed and Fuels3d metrics demonstrated the surface and near surface fuel hazard metrics can be measured using Fuels3D in a repeatable manner. The next stage of the research aims to develop methods to assess the accuracy of these metrics.

Analysis completed thus far has indicated that the measurements of height and cover captured using the Fuels3D app are highly correlated to biomass in grass and woodland environments. Further validation will make use of techniques commonly deployed in field ecology to ensure that the metrics derived are accurate and fully representative of the environment.

ACT parks and conservation participated in the fuels 3D app trial and believes it has strong promise in standardising the methodology for fuel metric estimation. The ACT has over 100 established fuel hazard sites which are assessed annually, and we find that different using observers each year causes considerable variability in results. The fuels 3D method would help achieve much greater consistency, reliability and repeatability.

– ***Tony Scherl, ACT Parks and Conservation Service***

Reference: *Spits* C, Wallace L, Reinke K. Investigating Surface and Near-Surface Bushfire Fuel Attributes: A Comparison between Visual Assessments and Image-Based Point Clouds. *Sensors*. 2017; 17(4):910.