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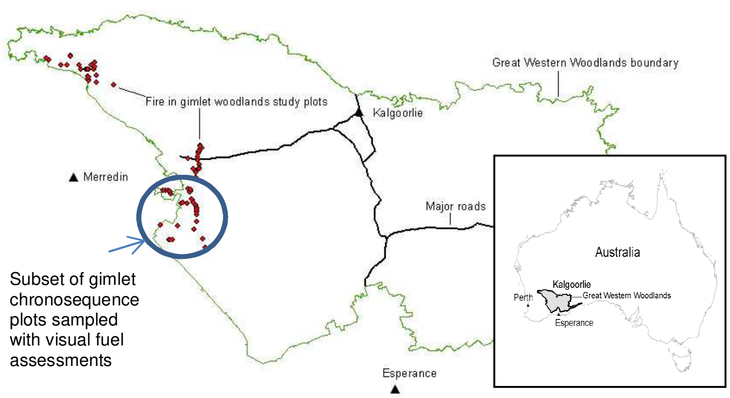
Validation of visual fuel assessments in gimlet woodlands

by Carl Gosper[1,2], Colin Yates[1], Suzanne Prober[2] and Georg Wiehl[2]
[1]Science and Conservation Division, [2]CSIRO Land and Water, (08) 93336442, carl.gosper@dpaw.wa.gov.au

Background

Understanding fire behaviour is critical for bushfire management and predicting consequences for biodiversity, human settlements and other assets. A wide variety of factors affect fire behaviour, including the quantity, type and spatial distribution of flammable fuel, fuel moisture content, topography and weather. Some fuel attributes are very time-consuming to measure in the field, which has led to the development of methods for rapidly visually estimating relevant parameters that can be used in lieu of quantitative measurements for fire behaviour prediction.

Visual fuel assessments are widely applied to support fire behaviour models in the dry eucalypt forests of southern Australia (Gould et. al. 2007, Hines et al. 2010). An important step in furthering the utility of visual assessments is to test their applicability in a greater diversity of ecosystems. Here, we quantify time since fire-related changes in fuels in *Eucalyptus salubris* (gimlet) woodlands in the Great Western Woodlands (GWW) using the visual fuel assessment methods of Gould et al. (2007) and compare this with quantitative fuel measurements conducted at the same sites (described in Science and Conservation Information Sheet 72/2014). *E. salubris* woodlands offer a novel ecosystem (c.f. dry eucalypt forests) for testing visual fuel assessment due to their lower likelihood of burning, occurrence at lower annual rainfall, having dominant trees and shrubs killed by fire intensities typical of the fires that occur in the GWW, and having slow biomass recovery via regeneration from seed.



Left: Map showing the location of plots in which visual fuel assessments were completed. Right: An example of mature *E. salubris* woodland (> 140 years post-fire).

Findings

The visual fuel assessment methodology adequately captured changes with time since fire in most fuels in *E. salubris* woodlands.

- There was strong correlation between visual fuel assessments and detailed quantitative measurements of maximum vegetation height and cover in Surface, Elevated, Intermediate and Canopy vegetation layers (Fig. 1a).
- Similar to quantitative measurements, visual assessments indicated that cover in several key fuel layers peaks at an intermediate time post-fire (Fig. 1b).

Several issues in the application of visual assessment methodology were identified, primarily associated with differences in community ecology in *E. salubris* woodlands compared to the dry eucalypt forests where the method was developed.

- Resolution of differences in Surface cover was poor due to woodlands having discontinuous ground fuel at most periods post-fire.
- Bark hazard scores varied according to the timing of sampling relative to that of bark shed.

- Dividing the vegetation into vertical strata limited the identification of trends in cover and hazard with time since fire. This was due to community dominance by non-resprouters, with the single cohort of vegetation passing incrementally through adjoining strata with time since fire.

Left: A typical example of *E. salubris* woodland of an intermediate (~40 years) time since fire, showing high cover and connectivity of the Surface fuel layer. Right: A typical mature *E. salubris* woodland (> 140 years post-fire), showing discontinuous and patchy cover of Surface fuel.

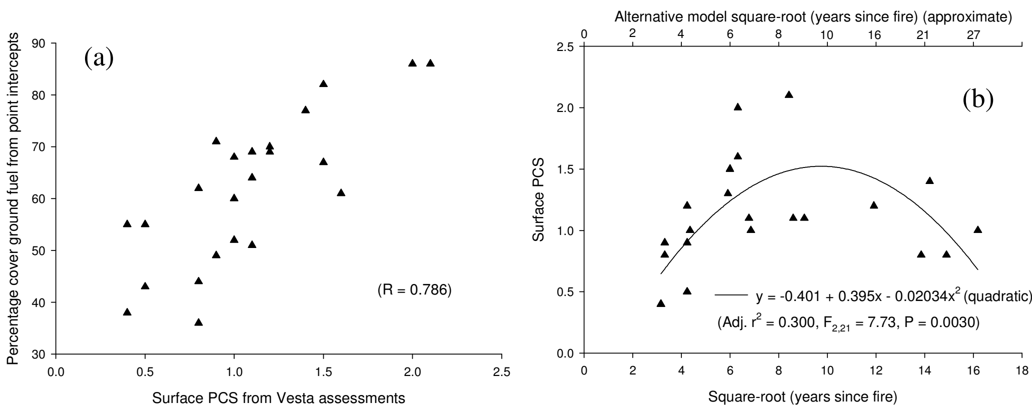


Fig. 1. (a) Relationship between ground fuel cover assessed through detailed quantitative measurements (Information Sheet 72/2014; y-axis) and percent cover score (PCS) of the Surface layer from visual fuel assessments (x-axis); (b) changes in PCS in the Surface fuel layer in *E. salubris* woodlands with time since fire, as measured with visual fuel assessments: the two x-axes show different time since fire ranges based on alternative models used to estimate stand age (see Information Sheet 65/2013), both of which are square-root transformed.

Management Implications

- Strong correlations between visual fuel assessments and quantitative measurements indicate that visual assessments adequately capture changes in fuel with time since fire in *E. salubris* woodlands. As visual assessments are more rapidly completed than quantitative measurements, more sites can be sampled per unit time.
- Patterns of change in vegetation cover and hazard suggest that flammability in *E. salubris* woodlands peaks at intermediate times since fire, although this conclusion would optimally be tested with experimental fires.
- Temporal variability in bark hazard likely results in bark hazard scores being a poor predictor of wildfire spotting risk in many communities dominated by smooth-barked *Eucalyptus*.
- Modification and subsequent testing of visual fuel assessment methods and criteria for lower-productivity and non-resprouter-dominated communities would be worthwhile.

Further reading:

Gosper CR, Yates CJ, Prober SM and Wiehl G (2014) Application and validation of visual fuel hazard assessments in dry mediterranean-climate woodlands. *International Journal of Wildland Fire* 23, 385-393.

Gould JS, McCaw WL, Cheney NP, Ellis PF and Matthews S (2007) Field guide. Fuel assessment and fire behaviour prediction in dry eucalypt forest. Ensis–CSIRO, Canberra and Department of Environment and Conservation, Perth.

Hines F, Tolhurst KG, Wilson AAG and McCarthy GJ (2010) Overall fuel hazard assessment guide. 4th edn. Fire and adaptive management, report no. 82. Victorian Government Department of Sustainability and Environment, Melbourne.

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