

**Supplementary material**

**Application and validation of visual fuel hazard assessments in dry Mediterranean-climate woodlands**

*Carl R. Gosper<sup>A,B,C</sup>, Colin J. Yates<sup>A</sup>, Suzanne M. Prober<sup>B</sup> and Georg Wiehl<sup>B</sup>*

<sup>A</sup>Science and Conservation Division, Department of Parks and Wildlife, Locked Bag 104, Bentley Delivery Centre, WA 6983, Australia.

<sup>B</sup>CSIRO Ecosystem Sciences, Private Bag 5, Wembley WA 6913 Australia.

<sup>C</sup>Corresponding author. Email: carl.gosper@dpaw.wa.gov.au

**Table S1. Alternative model forms and summary statistics for the relationship between visual fuel assessment measures ( $y$ ) and square-root (years since fire) ( $x$ )**

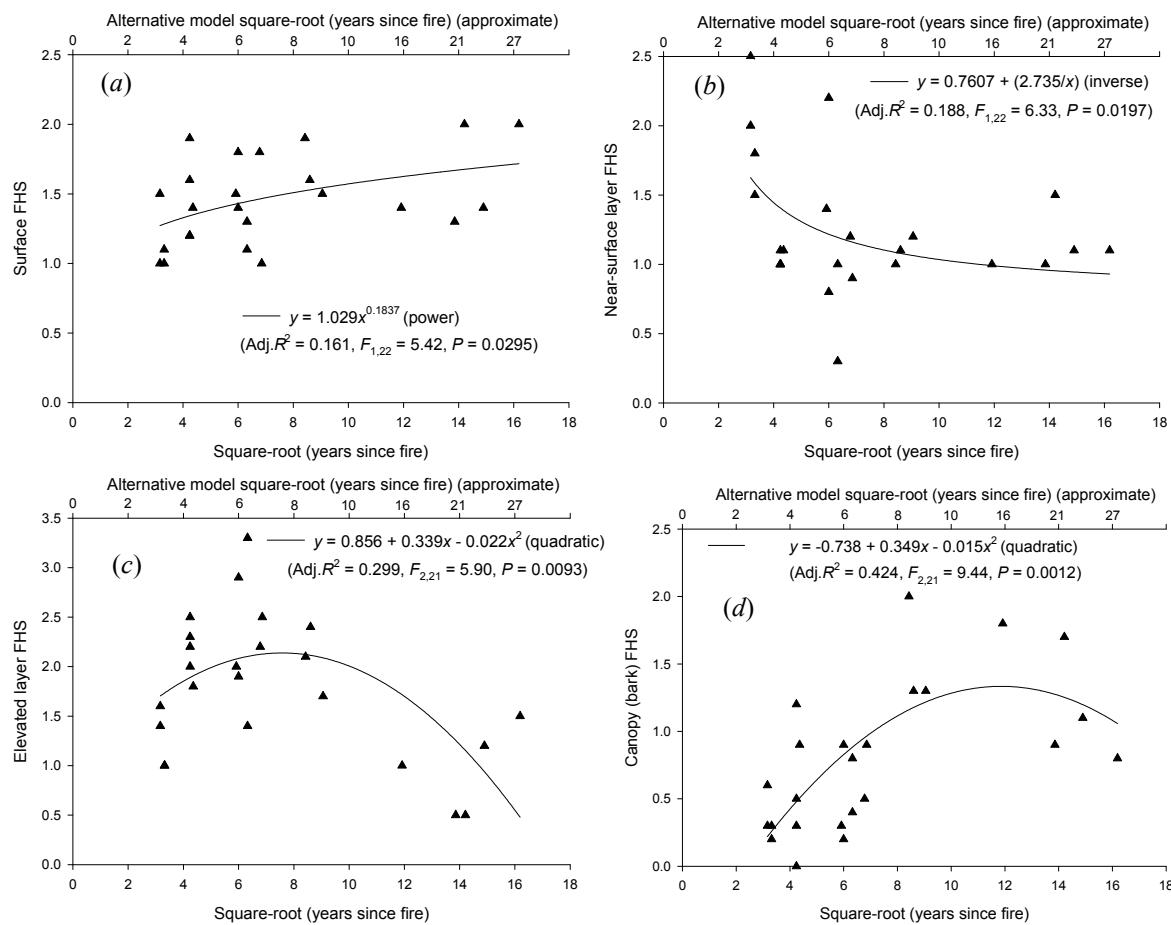
Time since fire in these regressions was from Model 2 of Gosper *et al.* (2013). The best relationships (determined by minimising AIC) are shown in bold.

PCS, percentage cover score; FHS, fuel hazard score

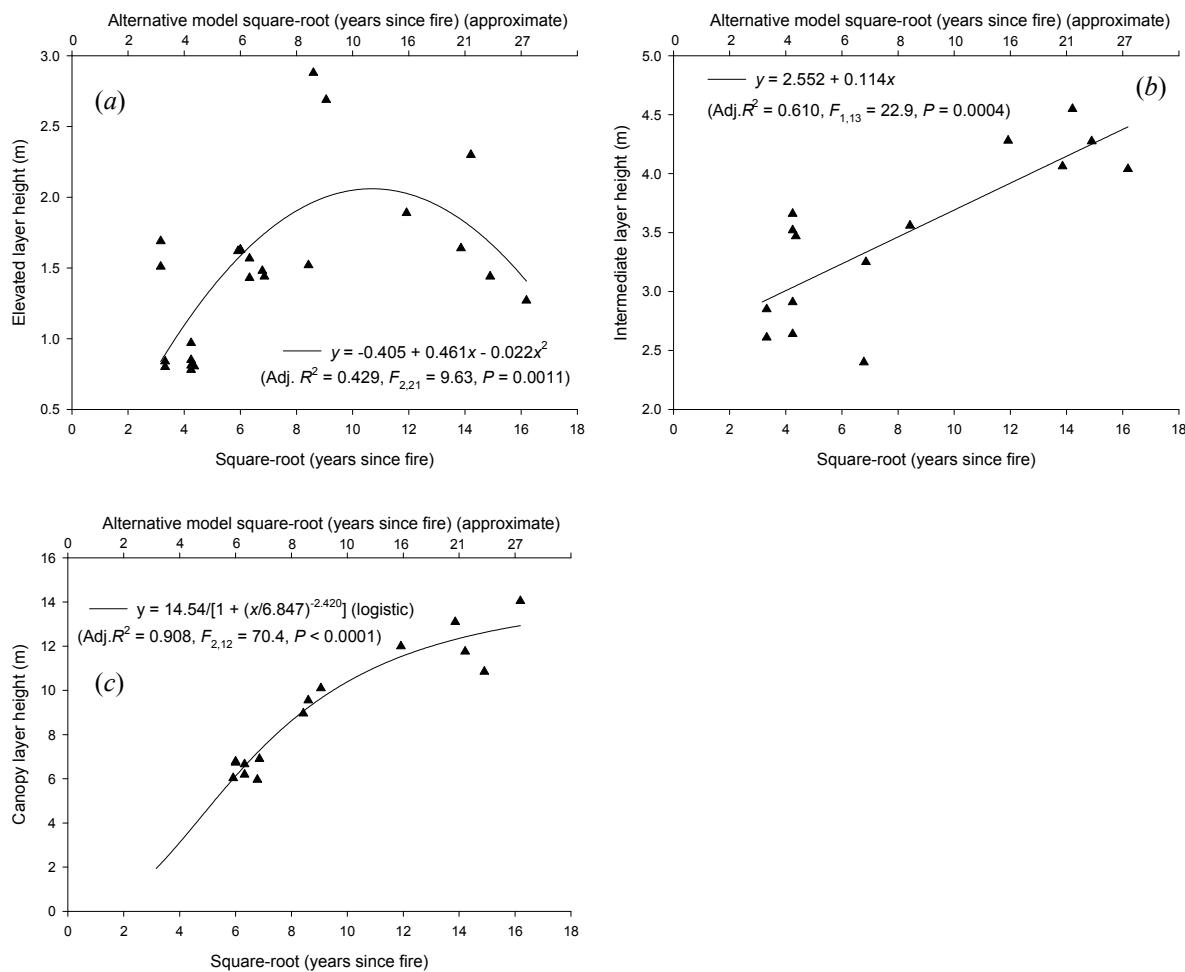
Function form	Model	$R^2$	Adj. $R^2$	d.f.	F	P	AIC
Litter depth (mm)							
Linear	$y = 8.991 + 0.3940x$	0.191	0.154	1,22	5.20	0.0326	61.85
Exponential	$y = 9.463e^{0.0301x}$	0.183	0.146	1,22	4.93	0.0370	62.09
Power	$y = 7.191x^{0.2654}$	0.222	0.186	1,22	6.27	0.0202	60.93
Quadratic	No significant relationship						
<b>Logistic</b>	$y = 13.104/(1 + (x/3.036)^{-6.139})$	<b>0.285</b>	<b>0.217</b>	<b>2,21</b>	<b>4.19</b>	<b>0.0293</b>	<b>60.88</b>
Surface PCS							
Linear	No significant relationship						
Exponential	No significant relationship						
Power	No significant relationship						
<b>Quadratic</b>	$y = -0.401 + 0.395x - 0.0203x^2$	<b>0.424</b>	<b>0.369</b>	<b>2,21</b>	<b>7.73</b>	<b>0.0030</b>	<b>-44.86</b>
Logistic	$y = 1.290/(1 + (x/3.453)^{-5.535})$	0.361	0.300	2,21	5.93	0.0091	-42.36
Surface FHS							
Linear	$y = 1.208 + 0.0337x$	0.182	0.144	1,22	4.88	0.0379	-54.68
Exponential	$y = 1.234e^{0.0219x}$	0.179	0.142	1,22	4.79	0.0395	-54.60
<b>Power</b>	$y = 1.029x^{0.1837}$	<b>0.198</b>	<b>0.161</b>	<b>1,22</b>	<b>5.42</b>	<b>0.0295</b>	<b>-55.16</b>
Quadratic	No significant relationship						
Logistic	No significant relationship						
Near-surface layer ht (m)							
Linear	No significant relationship						
Exponential	No significant relationship						
Power	No significant relationship						
Quadratic	No significant relationship						
Logistic	No significant relationship						

Function form	Model	$R^2$	Adj. $R^2$	d.f.	F	P	AIC
Near-surface layer PCS							
Linear	No significant relationship						
Exponential	No significant relationship						
<b>Inverse</b>	$y = 0.6973 + (2.883/x)$	<b>0.286</b>	<b>0.253</b>	<b>1,22</b>	<b>8.79</b>	<b>0.0071</b>	<b>-41.88</b>
Quadratic	$y = 2.432 - 0.309x - 0.0149x^2$	0.305	0.238	2,21	4.60	0.0220	-40.53
Logistic	No significant relationship						
Near-surface layer FHS							
Linear	No significant relationship						
Exponential	No significant relationship						
<b>Inverse</b>	$y = 0.7607 + (2.735/x)$	<b>0.223</b>	<b>0.188</b>	<b>1,22</b>	<b>6.33</b>	<b>0.0197</b>	<b>-36.50</b>
Quadratic	No significant relationship						
Logistic	No significant relationship						
Elevated layer height (m)							
Linear	$y = 1.014 + 0.063x$	0.204	0.168	1,22	5.64	0.0267	-27.79
Exponential	$y = 1.138e^{0.0346x}$	0.175	0.138	1,22	4.68	0.0417	-26.93
Power	$y = 0.764x^{0.3476}$	0.269	0.226	1,22	7.72	0.0109	-29.53
<b>Quadratic</b>	$y = -0.405 + 0.461x - 0.022x^2$	<b>0.478</b>	<b>0.429</b>	<b>2,21</b>	<b>9.63</b>	<b>0.0011</b>	<b>-35.92</b>
Logistic	$y = 2.005/(1 + (x/3.488)^{-2.100})$	0.335	0.272	2,21	5.29	0.0138	-30.10
Elevated layer PCS							
Linear	$y = 2.328 - 0.0795x$	0.229	0.194	1,22	6.52	0.0181	-20.39
Exponential	$y = 2.358e^{-0.0426x}$	0.200	0.164	1,22	5.50	0.0285	-19.52
Inverse	No significant relationship						
<b>Quadratic</b>	$y = 1.159 + 0.248x - 0.018x^2$	<b>0.361</b>	<b>0.300</b>	<b>2,21</b>	<b>5.94</b>	<b>0.0090</b>	<b>-22.92</b>
Logistic	$y = 1.991/(1 + (x/13.92)^{4.833})$	0.343	0.280	2,21	5.47	0.0122	-22.23
Elevated layer FHS							
Linear	$y = 2.326 - 0.0736x$	0.174	0.136	1,22	4.63	0.0427	-15.89
Exponential	No significant relationship						
Inverse	No significant relationship						
<b>Quadratic</b>	$y = 0.856 + 0.339x - 0.022x^2$	<b>0.360</b>	<b>0.299</b>	<b>2,21</b>	<b>5.90</b>	<b>0.0093</b>	<b>-20.02</b>
Logistic	$y = 2.024/(1 + (x/14.023)^{5.232})$	0.303	0.237	2,21	4.57	0.0225	-17.99
Intermediate layer height (m)							
<b>Linear</b>	$y = 2.552 + 0.114x$	<b>0.638</b>	<b>0.610</b>	<b>1,13</b>	<b>22.9</b>	<b>0.0004</b>	<b>-21.74</b>
Exponential	$y = 2.663e^{0.0315x}$	0.635	0.607	1,13	22.6	0.0004	-21.64
Power	$y = 2.079x^{0.2605}$	0.624	0.595	1,13	21.6	0.0005	-21.18
Quadratic	$y = 2.520 + 0.123x - 0.0005x^2$	0.638	0.577	2,12	10.6	0.0023	-19.74
Logistic	No significant relationship						

Function form	Model		R <sup>2</sup>	Adj. R <sup>2</sup>	d.f.	F	P	AIC
Intermediate layer PCS								
Linear	No significant relationship							
Exponential	No significant relationship							
Power	No significant relationship							
Quadratic	No significant relationship							
Logistic	No significant relationship							
Intermediate layer FHS								
Linear	No significant relationship							
Exponential	No significant relationship							
Power	No significant relationship							
Quadratic	Failed regression assumptions							
Logistic	No significant relationship							
Canopy layer height (m)								
Linear	$y = 2.391 + 0.7057x$	0.884	0.875	1,13	99.1	<0.0001	2.05	
Exponential	$y = 4.531e^{0.070x}$	0.852	0.840	1,13	74.6	<0.0001	7.97	
Power	$y = 1.767x^{0.7343}$	0.894	0.886	1,13	109	<0.0001	-0.01	
Quadratic	$y = -3.623 + 2.004x - 0.0611x^2$	0.918	0.905	2,12	67.3	<0.0001	-4.30	
Logistic	$y = 14.54/(1 + (x/6.847)^{-2.420})$	<b>0.922</b>	<b>0.908</b>	<b>2,12</b>	<b>70.4</b>	<b>&lt;0.0001</b>	<b>-5.30</b>	
Canopy layer PCS								
Linear	$y = 0.287 + 0.1196x$	0.247	0.213	1,22	7.22	0.0135	-3.26	
Exponential	$y = 0.708e^{0.065x}$	0.175	0.137	1,22	4.65	0.0423	-1.05	
Power	$y = 0.324x^{0.671}$	0.287	0.255	1,22	8.86	0.0070	-4.57	
Quadratic	$y = -2.846 + 0.998x - 0.0477x^2$	<b>0.702</b>	<b>0.674</b>	<b>2,21</b>	<b>24.8</b>	<b>&lt;0.0001</b>	<b>-23.5</b>	
Logistic	Failed regression assumptions							
Canopy (bark) FHS								
Linear	$y = 0.230 + 0.0778x$	0.335	0.304	1,22	11.1	0.0031	-34.12	
Exponential	$y = 0.463e^{0.0704x}$	0.276	0.244	1,22	8.40	0.0083	-32.10	
Power	$y = 0.210x^{0.6908}$	0.356	0.327	1,22	12.2	0.0021	-34.90	
Quadratic	$y = -0.738 + 0.349x - 0.015x^2$	<b>0.474</b>	<b>0.424</b>	<b>2,21</b>	<b>9.44</b>	<b>0.0012</b>	<b>-37.74</b>	
Logistic	$y = 1.427/(1 + (x/5.598)^{-2.615})$	0.425	0.370	2,21	7.75	0.0030	-35.60	
Maximum vegetation height (m)								
Linear	$y = 0.073 + 0.904x$	0.910	0.906	1,22	221	<0.0001	11.63	
Exponential	$y = 2.975e^{0.101x}$	0.812	0.803	1,22	94.7	<0.0001	29.30	
Power	$y = 1.054x^{0.938}$	0.913	0.909	1,22	231	<0.0001	10.7	
Quadratic	$y = -4.27 + 2.121x - 0.066x^2$	0.966	0.963	2,21	299	<0.0001	-9.82	
Logistic	$y = 14.46/(1 + (x/6.841)^{-2.475})$	<b>0.969</b>	<b>0.966</b>	<b>2,21</b>	<b>323</b>	<b>&lt;0.0001</b>	<b>-11.6</b>	



**Fig. S1.** Changes in fuel hazard scores (FHS) in fuel layers in *Eucalyptus salubris* woodlands with time since fire, as measured with visual fuel assessments: (a) Surface; (b) Near-surface; (c) Elevated and (d) Canopy (bark). There were no significant relationships between Intermediate layer FHS and time since fire (Table 3). Analyses were conducted using the time since fire data from Model 2 of Gosper *et al.* (2013) (bottom x-axis), but the equally valid alternative time since fire distribution from Model 5 of Gosper *et al.* (2013) is shown (top x-axis; approximate) for comparison.



**Fig. S2.** Changes in fuel layer heights with time since fire in *Eucalyptus salubris* woodlands, as measured with Vesta visual fuel assessments: (a) Elevated layer; (b) Intermediate layer and (c) Canopy layer. There were no significant relationships between height of the Near-surface layer and time since fire (Table 3). Analyses were conducted using the time since fire data from Model 2 of Gosper *et al.* (2013) (bottom x-axis), but the equally valid alternative time since fire distribution from Model 5 of Gosper *et al.* (2013) is shown (top x-axis; approximate) for comparison.

## Reference

- Gosper CR, Prober SM, Yates CJ, Wiehl G (2013) Estimating the time since fire of long-unburnt *Eucalyptus salubris* (Myrtaceae) stands in the Great Western Woodlands. *Australian Journal of Botany* **61**, 11–21.  
[doi:10.1071/BT12212](https://doi.org/10.1071/BT12212)