



Low intensity hazard reduction burn. Photo: Marta Yebra.

- Key Topics:
- fuel reduction [2]
 - planning [3]
 - prescribed burning [4]


Optimisation of fuel reduction burning regimes [5]
This research represents a concerted effort to understand the effect of prescribed burning on water quantity and carbon losses and gains in forested ecosystems in south eastern Australia. The research team collected empirical data from over 100 sampling sites treated with a recent prescribed burn, selected to accommodate as much site variability as possible and to take full advantage of prescribed burn plans. Data collected from the field was used in a variety of modelling assignments to capture the effect of prescribed burning on changes in water availability and transformation of carbon pools. Using a mixture of models and empirical sampling and analysis, the research showed that there are few risks to long-term carbon and water cycles when prescribed burning is conducted on cycles of 10 or so years.

Project: detail Notabs

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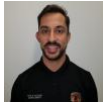


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Description


Fire managers often have multiple objectives for a given prescribed burn centred around risk reduction and conservation of biodiversity. The ability to predict the effects of prescribed burning on the capacity of forests to deliver ecosystem services such as clean air, carbon sequestration, and a reliable and high-quality supply of water is becoming increasingly more important.

This research represents a concerted effort to understand the effect of prescribed burning on water quantity and carbon losses and gains in forested ecosystems in south-eastern Australia. The research team collected empirical data from over 100 sampling sites treated with a recent prescribed burn. The sampling strategy used was consistent over time with target sampling variables included for estimation of overstorey and understorey biomass and direct sampling of surface and near surface fuel loads. Site selection was stratified to accommodate as much site variability as possible and to take full advantage of prescribed burn plans.

Data collected from the field was used in a variety of modelling assignments to capture the effect of prescribed burning on changes in water availability and transformation of carbon pools. Using a mixture of models and empirical sampling and analysis, the research showed that there are few risks to long-term carbon and water cycles when prescribed burning is conducted on cycles of 10 or so years. Critical to this analysis is the frequency of bushfires – if the inter-fire interval of unplanned fires becomes short (e.g., <50 years) then ecosystem losses of carbon and reductions in water yield are likely to become semi-permanent features.

[Read the final report here.](#) [29]

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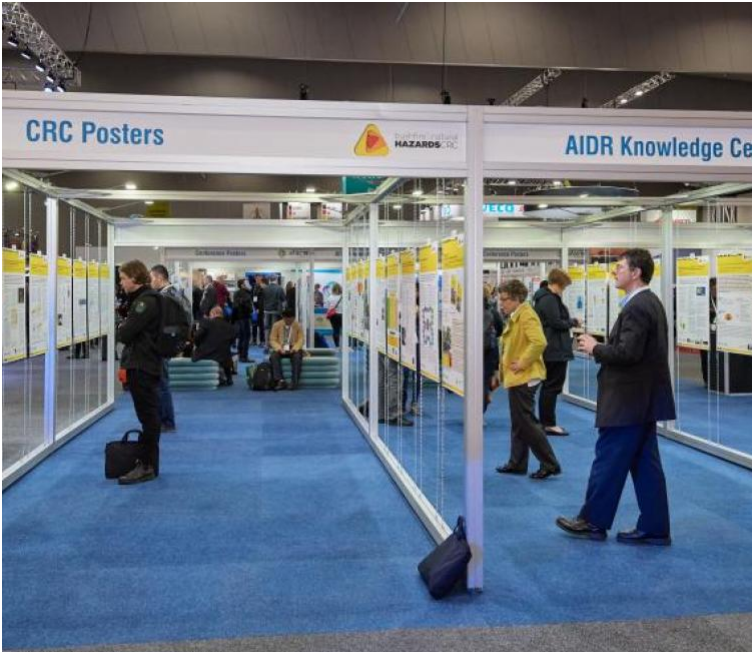
 Optimisation of fuel reduction burning regimes - project overview [30]

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Publications

Year	Type	Citation
2021	Report	Bell, T. [6] <i>et al.</i> Optimisation of fuel reduction burning regimes for fuel reduction, carbon, water and vegetation outcomes – final project report [29]. (Bushfire and Natural Hazards CRC, 2021).
2020	Journal Article	Adams, M. A. [10], Shadmanroodposhti, M. [50] & Neumann, M. [51] Causes and consequences of Eastern Australia's 2019–20 season of mega fires: A broader perspective [52]. <i>Global Change Biology</i> 26 , 103–115 (2020).DOI [60] Google Scholar [61] BibTeX [62] EndNote XML [63]
2020	Journal Article	Adams, M. A. [10], Buckley, T. N. [57] & Turnbull, T. L. [58] Diminishing CO2-driven gains in water-use efficiency of global forests [59]. <i>Nature Climate Change</i> 10 , 466–471 (2020).DOI [60] Google Scholar [61] BibTeX [62] EndNote XML [63]
2020	Report	Bell, T. [6], Parnell, D. [8] & Possell, M. [12] Sampling and data analysis of field sites of 40 prescribed burns [64]. (Bushfire and Natural Hazards CRC, 2020). Google Scholar [65] BibTeX [66] EndNote XML [67]
2020	Report	Parnell, D. [8], Bell, T. [6] & Possell, M. [12] Quantifying the conversion of vegetation to ash for soil carbon fingerprinting [68]. (Bushfire and Natural Hazards CRC, 2020). Google Scholar [69] BibTeX [70] EndNote XML [71]
2020	Report	Parnell, D. [8], Bell, T. [6] & Possell, M. [12] Near infrared spectroscopy as a new fire severity metric [72]. (Bushfire and Natural Hazards CRC, 2020). Google Scholar [73] BibTeX [74] EndNote XML [75]
2020	Report	Bell, T. [6] Optimisation of fuel reduction burning regimes for fuel reduction, carbon, water and vegetation outcomes: annual report 2019-2020 [76]. (Bushfire and Natural Hazards CRC, 2020).
2020	Report	Yu, M. [27], Pepper, D. [9], Bell, T. [6] & Possell, M. [12] Detecting the effects of prescribed burning using generalised additive modelling [80]. (Bushfire and Natural Hazards CRC, 2020). Google Scholar [81] BibTeX [82] EndNote XML [83]
2020	Report	Pepper, D. [9], Bell, T. [6], Possell, M. [12] & Parnell, D. [8] Model predictions for fuel reduction burning of eucalypt open forest in the greater Blue Mountains region [84]. (Bushfire and Natural Hazards CRC, 2020).
2020	Report	Parnell, D. [8], Possell, M. [12] & Bell, T. [6] Estimating carbon stocks and biomass in surface fuel layers [88]. (Bushfire and Natural Hazards CRC, 2020). Google Scholar [89] BibTeX [90] EndNote XML [91]
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2019	Report	Karunaratne, S. [96], Possell, M. [12], Pepper, D. [9] & Bell, T. [6] Modelling emissions from prescribed burning using FULLCAM [97]. (Bushfire and Natural Hazards CRC, 2019). Google Scholar [98] BibTeX [99] EndNote XML [100]
2018	Journal Article	Gharun, M. [101], Possell, M. [12], R. Vervoort, W. [102], Adams, M. A. [10] & Bell, T. [6] Can a growth model be used to describe forest carbon and water balance after fuel reduction burning in eucalypt forests? [103]. <i>Forest Ecology and Management</i> 418 , 103–115 (2018).DOI [104] Google Scholar [105] BibTeX [106] EndNote XML [107]
2018	Report	Bell, T. [6], Parnell, D. [8] & Possell, M. [12] Sampling and data analysis of field sites in NSW [108]. (Bushfire and Natural Hazards CRC, 2018). Google Scholar [109] BibTeX [110] EndNote XML [111]
2017	Conference Paper	Rumsewicz, M. [112] Research proceedings from the 2017 Bushfire and Natural Hazards CRC and AFAC Conference [113]. <i>Bushfire and Natural Hazards CRC & AFAC annual conference 2017 (AFAC17)</i> (2017).
2017	Conference Paper	Gharun, M. [101], Possell, M. [12] & Bell, T. [6] Modelling feedback between fuel reduction burning and forest carbon and water balance in eucalypt forests [117]. <i>AFAC17</i> (Bushfire and Natural Hazards CRC, 2017).
2017	Journal Article	Gharun, M. [101] <i>et al.</i> Improving forest sampling strategies for assessment of fuel reduction burning [121]. <i>Forest Ecology and Management</i> 392 , 78–89 (2017).DOI [122] Google Scholar [123] BibTeX [124] EndNote XML [125]
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2017	Report	Bell, T. [6] Optimisation of fuel reduction burning regimes for fuel reduction, carbon, water and vegetation outcomes: annual report 2016-17 [131]. (Bushfire and Natural Hazards CRC, 2017). Google Scholar [132] BibTeX [133] EndNote XML [134]
2017	Report	Gharun, M. [101], Possell, M. [12] & Bell, T. [6] Calibration of water balance using digital photography [135]. (Bushfire and Natural Hazards CRC, 2017). Google Scholar [136] BibTeX [137] EndNote XML [138]
2016	Journal Article	Jenkins, M. E. [139], Bell, T. [6], Poon, L. Fan [140], Aponte, C. [141] & Adams, M. A. [10] Production of pyrogenic carbon during planned fires in forests of East Gippsland, Victoria [142]. <i>Forest Ecology and Management</i> 382 , 103–115 (2016).DOI [143] Google Scholar [144] BibTeX [145] EndNote XML [146]
2016	Report	Possell, M. [12], Gharun, M. [101] & Bell, T. [6] Application of statistical techniques to pyrolysis-GC-MS data from soil to identify the impact of fire [147]. (Bushfire and Natural Hazards CRC, 2016).
2016	Report	Bell, T. [6] Optimisation of fuel reduction burning regimes for fuel reduction, carbon, water and vegetation outcomes: Annual project report 2015-2016 [151]. (Bushfire and Natural Hazards CRC, 2016).
2015	Journal Article	Gharun, M. [101], Turnbull, T. L. [58], Henry, J. [155] & Adams, M. A. [10] Mapping spatial and temporal variation in tree water use with an elevation model and gridded temperature data [156]. <i>Australian Journal of Botany</i> 63 , 103–115 (2015).DOI [157] Google Scholar [158] BibTeX [159] EndNote XML [160]
2015	Journal Article	Gharun, M. [101], Amzi, M. [161] & Adams, M. A. [10] Short-term forecasting of water yield from forested catchments after bushfire: a case study from south-east Australia [162]. <i>Water</i> 7 , 599–611 (2015).DOI [163] Google Scholar [164] BibTeX [165] EndNote XML [166]
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2015	Presentation	Possell, M. [12] Optimisation of fuel reduction burning regimes for fuel reduction, carbon, water and vegetation outcomes [184]. (2015). Google Scholar [185] BibTeX [186] EndNote XML [187]
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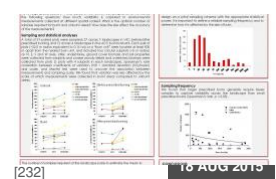
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13 May 2020	Webinar 2 (13 May): Tina Bell presentation [224]	8.48 MB	[225] (8.48 MB), impacts [221], prescribed burni
14 May 2020	Webinar 2 (13 May): Mark Adams presentation [226]	4.21 MB	[227] (4.21 MB), impacts [221], prescribed burni
01 Jun 2020	Q&A with A/Prof Tina Bell - National Fire Fuels Science webinar: the science of hazard reduction [228]	0 bytes	[229] (0 bytes), severity [230], prescribed burni

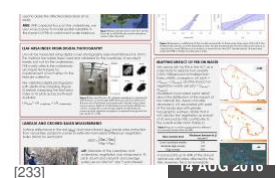
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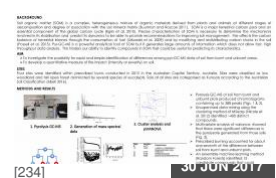
Optimisation of fuel reduction burning regimes: Determining fire size [231]
Optimising fuel reduction burning at the landscape- or catchment-scale requires knowledge of the effects of...



Spatial Variability After Prescribed Burning: Effects on Vegetation and Soil Properties [232]
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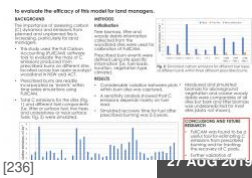
Estimation of the impact of fuel-reduction burning on catchment water balance using digital photography [233]
FUEL REDUCTION [2]
This project focuses on improving the capability of land managers to use prescribed fire to reduce fuel loads...



Assessing the impact of fire using soil and pyrolysis-GC-MS [234]
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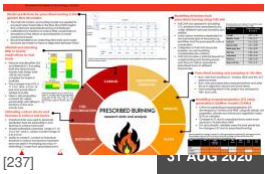
Understanding carbon pools to improve emission estimates from fires [235]
FUEL REDUCTION [2], PLANNING [3]
*Use of prescribed burning creates emissions and particulates. However, fire management can potentially...



Modelling carbon emissions from prescribed burning using FullCAM

FUEL REDUCTION [2], PLANNING [3]

The Full Carbon Accounting Model (FullCAM) is a software tool developed by the Australian Government...



An interdisciplinary approach to examine trade-offs between environmental objectives and prescribed burning

FUEL REDUCTION [2]

Key findings: Optimisation of fuel reduction burning regimes for carbon, water and vegetation

Linked Projects

Mapping bushfire hazard and impacts

BUSHFIRE PREDICTIVE SERVICES [239]

A/Prof Marta Yebra
Australian National University [240]



[240]

Fire surveillance and hazard mapping

BUSHFIRE PREDICTIVE SERVICES [239]

Prof Simon Jones
RMIT University [24]



[24]

Fire spread prediction across fuel types

BUSHFIRE PREDICTIVE SERVICES [239]

A/Prof Khalid Moinuddin
Victoria University [243]



[243]

Improving land dryness measures and forecasts

SEVERE AND HIGH IMPACT WEATHER [245]

Dr Imtiaz Dharssi
Bureau of Meteorology [246]



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Scenario planning for remote community risk management in northern Australia

PRESCRIBED BURNING AND CATCHMENT MANAGEMENT [248]

Adj Prof Jeremy Russell-Smith
Charles Darwin University [249]



[249]

Mapping the area of Tathra to study, if Mechanical Fuel Load Reduction (MFLR) along with prescribed burning can save houses (in future) at Tathra NSW

PRESCRIBED BURNING AND CATCHMENT MANAGEMENT [248]

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