


# EFFECTS OF LONG-TERM REPEATED PRESCRIBED FIRE ON LITTER AND SOIL CARBON AND NITROGEN IN A MIXED EUCALYPT FOREST

**Hari Ram Shrestha**[1,2*], Dinesh Madhavan[1], Lauren Bennett[1], Kevin Tolhrust[1], Peter Hopmans[3], Christopher Weston[1,2] and Thomas Baker[1]

*h.shrestha@student.unimelb.edu.au [1] Department Forest and Ecosystem Science, The University of Melbourne, Victoria
[2] Bushfire CRC, [3] Timberlands Research Pty Ltd, Victoria

## Introduction

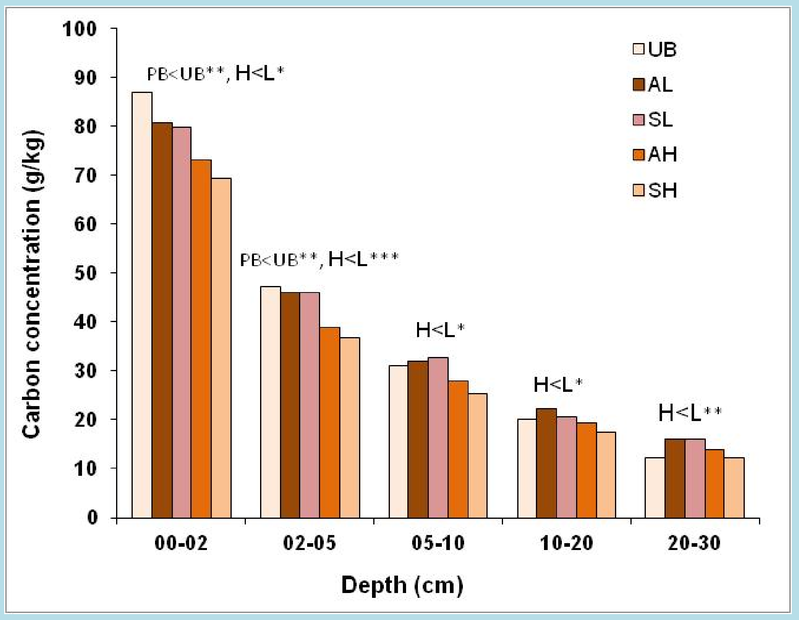
Prescribed fire or planned burning is an effective management tool and has been used to reduce the risk of wildfire on public lands in Australia for the last six decades. The impact of repeated prescribed fire on litter and soil and nutrient cycling needs to be better understood for sustainable management of Australian native forests.

## Methods

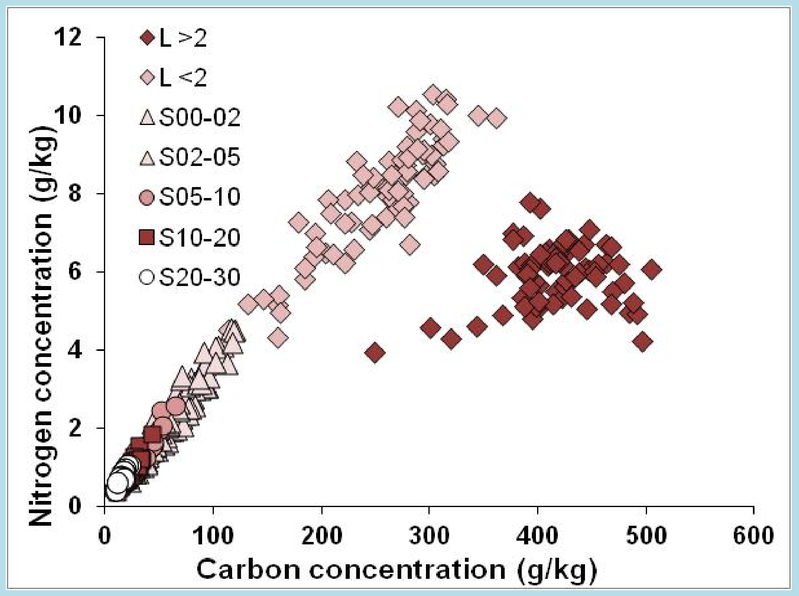

Five permanent long-term fire effects study areas (FESAs) were established in the Wombat State Forest, Victoria in 1984. Low intensity fire treatments have now been applied since 1985 in spring and autumn at three and ten year interval to long-unburnt forest.

- Treatments: Long unburnt reference (UB), 3-year cycle (high frequency) spring (SH) and autumn (AH); 10-year cycle (low frequency), spring (SL) and autumn (AL) burning.
- Integrated litter and soil (0-2, 2-5, 5-10, 10-20 and 20-30 cm depth) sampling was conducted in 75 × 0.1 ha plots in autumn 2012 (26 years after the fire treatment commenced).
- Analysis: Total C and total N (Dumas combustion) and mid-infrared (MIR) spectroscopic analysis.

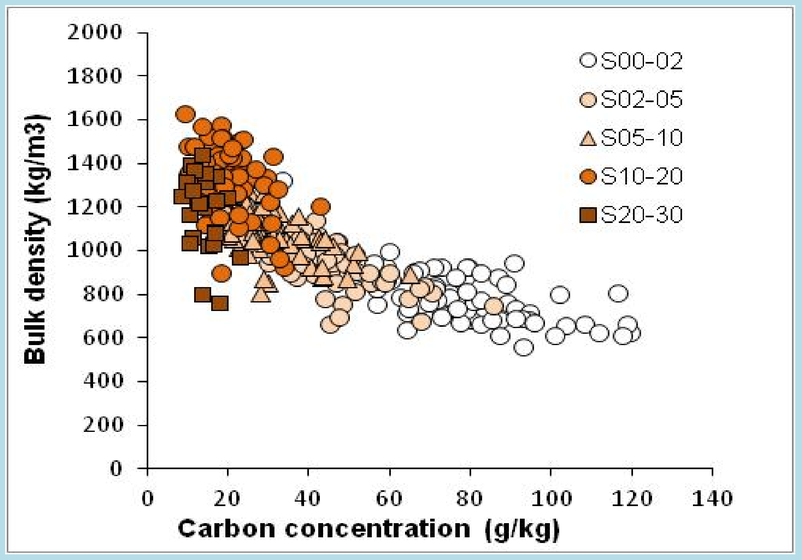
## Results




Soil C concentrations were reduced significantly in the frequent burning treatments.
(PB – Prescribed burning, UB – Unburnt, H – High frequency, L – Low frequency).

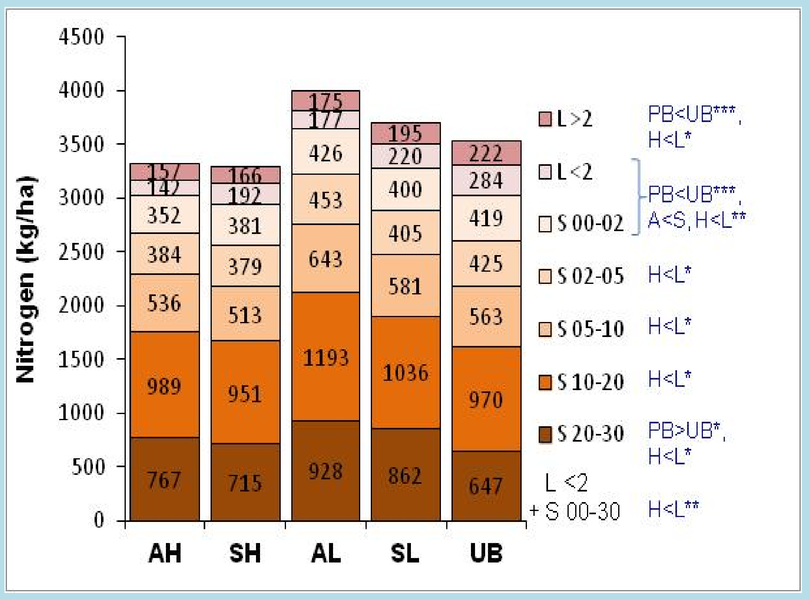



Treatments had no effect on litter and soil C to N ratios.

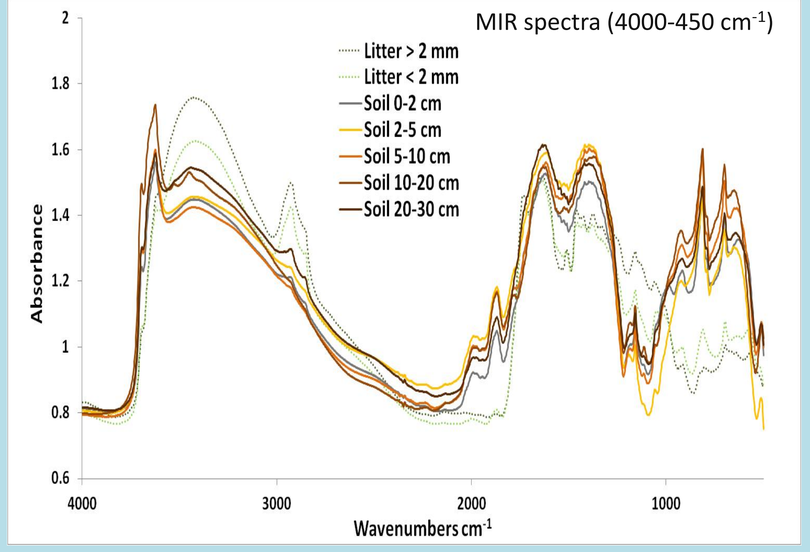



Burning treatments changed the soil bulk density significantly on 0-2 and 2-5 cm (PB>UB*) layers which was correlated with changes in C concentration.




Both season and frequency of burning affected litter and soil C and N stocks. C stocks (0-30 cm depth) were about 10 Mg ha$^{-1}$ lesser in the frequent burning treatments (AH & SH), while corresponding N stocks were about 530 kg ha$^{-1}$ lesser. (PB – Prescribed burning, UB – Unburnt, A – Autumn burning, S – Spring burning, H – High frequency, L – Low frequency).




Litter < 2 mm had higher COOH, C=C and C-H, however SH had higher intensities of ligno-celluloses. No treatment differences were found in soils, though 10-30 cm in AL had higher recalcitrant materials.

## Future works

- Soil organic matter fractionation: Automated wet sieving system.
- Charcoal C estimation in soil by acid digestion.
- Soil respiration and potential mineralizable nitrogen in soils.

## Acknowledgements

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