Modelling carbon emissions from prescribed burning using FullCAM

Senani Karunaratne, Malcolm Possell, Tina Bell, David Pepper

School of Life and Environmental Sciences, Faculty of Science, University of Sydney, Sydney, NSW 2006, Australia
Bushfire and Natural Hazards CRC, East Melbourne, VIC 3002, Australia

The Full Carbon Accounting Model (FullCAM) is a software tool developed by the Australian Government, Department of the Environment and Energy, as a standardised method for carbon accounting. We made use of site specific data and the customizable procedure in FullCAM to simulate the effects of prescribed burn events in eucalypt woodlands in south eastern Australia to evaluate the efficacy of this model for land managers.

BACKGROUND

The importance of assessing carbon (C) dynamics and emissions from planned and unplanned fire is increasing, particularly for land managers.

- This study used the Full Carbon Accounting (FullCAM) software tool to evaluate the mass of C emissions produced from prescribed burns on different sites located across low open eucalypt woodland in NSW and ACT.
- Prescribed burns are readily incorporated as 'events' within time series simulations using FullCAM.
- Total C emissions for the sites (Fig. 1) and different fuel components (i.e. litter or surface fuel, live trees and understorey or near surface fuels; Fig. 2) were simulated.

METHODS

Initialisation

Tree biomass, litter and woody debris information collected from the woodland sites were used for calibration of FullCAM.

Prescribed burn events were defined using site specific information (i.e. fuel loads, location, vegetation type, climate).

RESULTS

- Considerable variation between plots within burn sites was captured.
- A sensitivity analysis showed that C emissions depends mainly on fuel load.
- Simulated recovery time for fuel after prescribed burning was 2-3 years.

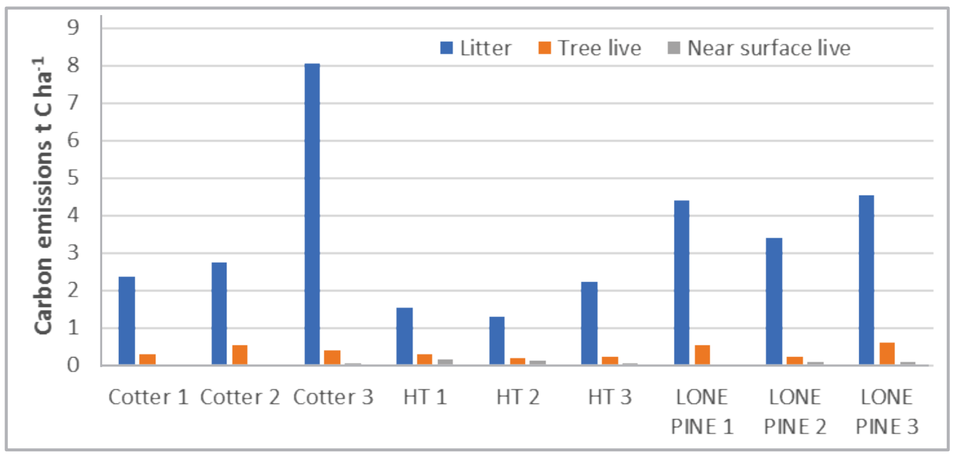

Fig. 2: Simulated carbon emissions for different fuel types at different plots within three different prescribed burns.

- Measured and simulated biomass for aboveground vegetation and coarse woody debris were comparable at all sites but bark and litter biomass was underpredicted for most sites (data not shown).

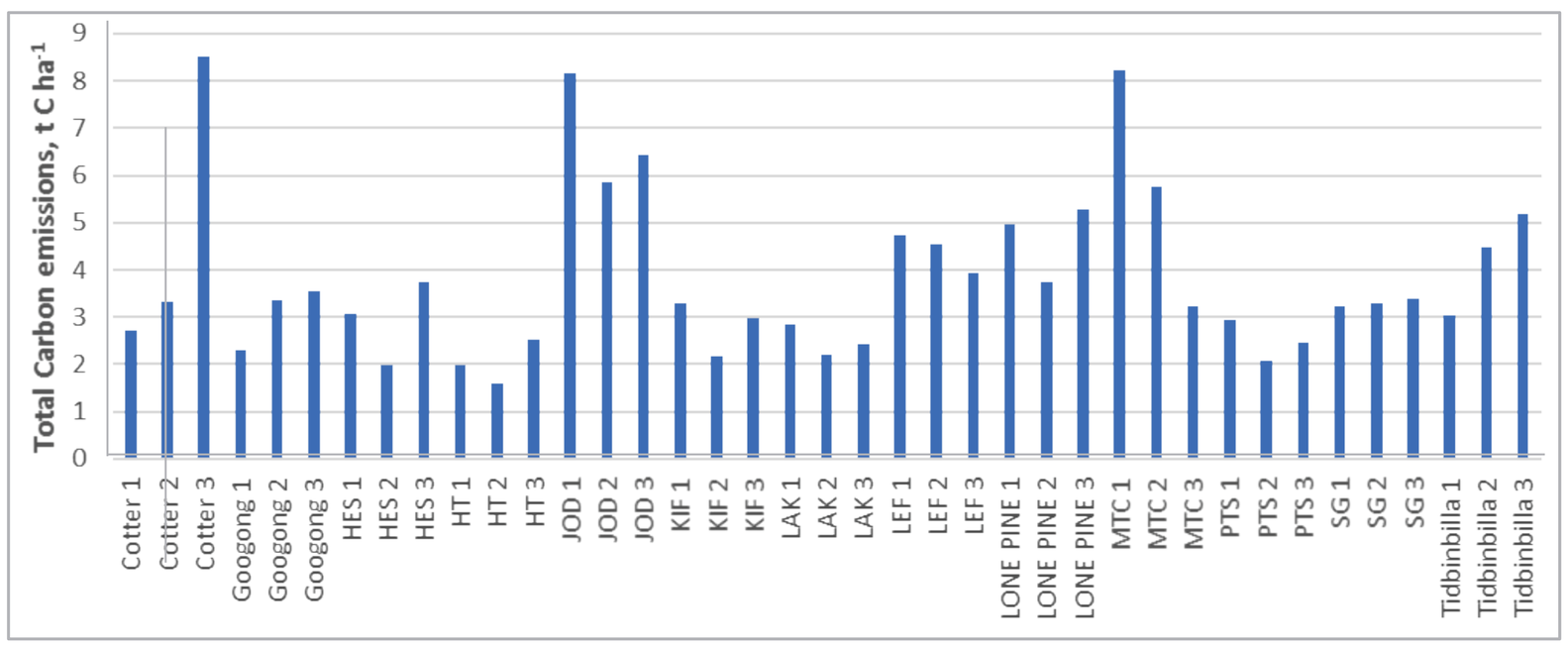

Fig. 1: Simulated total carbon emissions from prescribed burns at a range of open eucalypt woodland sites across NSW and ACT.

CONCLUSIONS AND FUTURE RESEARCH

- FullCAM was found to be a useful tool for estimating C emissions from prescribed burning and for tracking the recovery of C pools.
- Further validation of predictions of biomass and C emissions using FullCAM are currently being tested.
- In particular, over- and understorey biomass will be treated as separate pools rather than being aggregated.

END USER STATEMENT, Dr Felipe Aires, Office of Environment and Heritage, NSW

The capacity to accurately predict carbon emissions produced during prescribed burning activities is essential for designing regional burning programs aimed at optimising trade-offs among outcomes involving risk reduction and ecosystem services including C storage.

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