

EFFECTS OF REPEATED PLANNED BURNING ON CARBON FRACTIONS IN FOREST SOILS

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Background



Planned fire (prescribed fire) is used to reduce the risk of wildfires. The area of planned burning in Victoria has significantly increased in recent years. However, the ecological impacts of burning on soil carbon and nutrient cycling needs to be better understood.

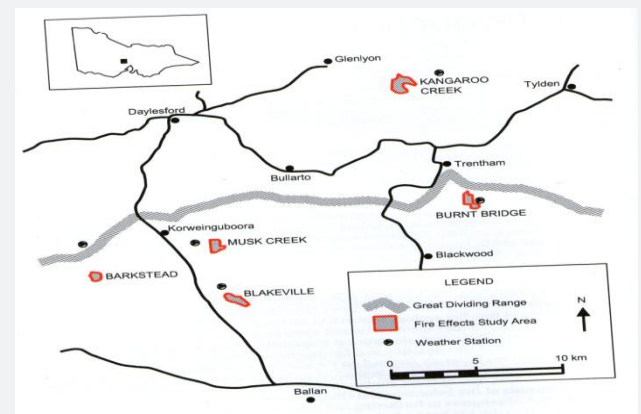
Research questions



- What are the effects of repeated burning on litter accumulation on the forest floor?
- Does repeated fire change the proportions of soil organic carbon (e.g. particulate, humic and char C) fractions?
- Is char-C accumulating in soil profile and are there any effects on the availability of soil N?

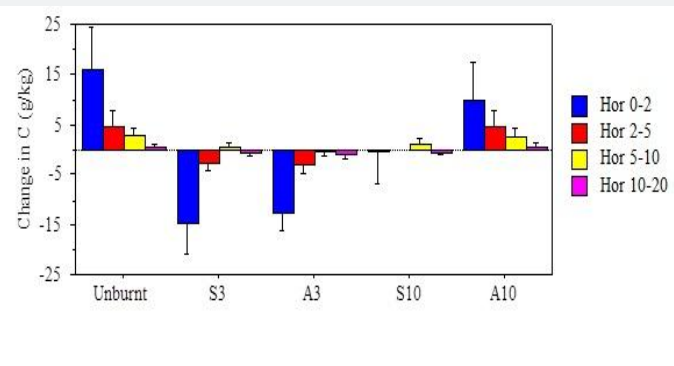


Study area



Wombat State Forest Fires Effects Study Areas Victoria

Five permanent long-term Fire Effects Study Areas (FESAs) were established in the Wombat State Forest, Victoria in 1984 to study the ecological effects of repeated low intensity burning. Within each FESA, five treatment areas were established: control (C), three year cycle, spring (S3) or autumn (A3) burning; and 10 year cycle, spring (S10) or autumn (A10).



Average changes in soil C after 15 years in the Wombat Forest FESAs (DSE 2003)

Analysis of soils sampled in 1985 and in 1998 showed a decrease in soil C concentrations under short cycle burning.

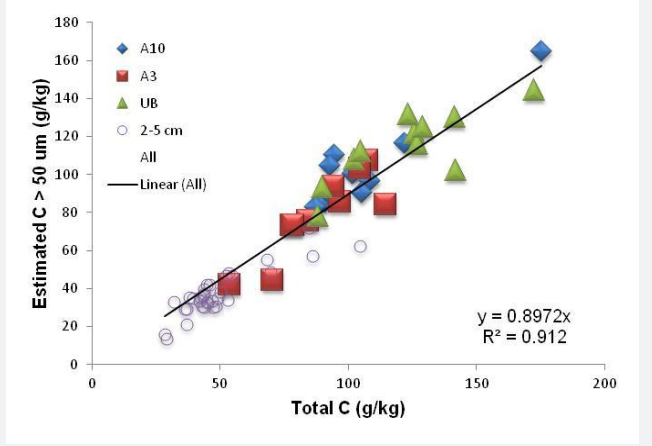
Soil organic matter fractionation

Litter and soil samples collected from the Wombat Forest FESAs in 2012 will be analyzed according to fraction sizes (litter < > 2 mm; soil < > 50 µm).

Litter and soil sampling in the field



Automated wet-sieving shaker and soil fractions after sieving (50 µm)



Relationship between total C and C in soil > 50 µm fraction

Preliminary work done on soil fractionation using soils collected in 1998 showed that > 80 % total C is in the > 50 µm fraction.

Analytical methods to be applied to whole soil and litter fractions include:

- Soil total C and N measured by dry combustion in LECO.
- Char C in soil will be determined by (i) hydrogen-peroxide and nitric acid digestion and (ii) Pyrolysis-Gas Chromatography-Mass Spectrometry (Py-GC-MS).
- Soil C pools: POC, humus and char-C will be predicted by MIR-PLSR calibration developed from direct measurements.

Expected outcomes

The study will improve knowledge on the effects of planned burning on soil C stocks, and on nutrient cycling and ecosystem function, and help underpin the sustainable management of Australian native forests.