

# Fuel for thought: Do litter-dwelling invertebrates control fine fuel loads in frequently burnt forests?



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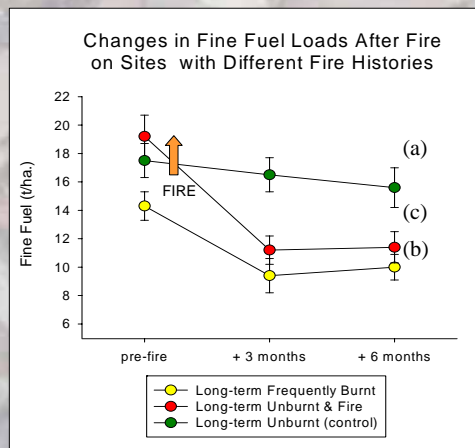
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Bushfire CRC Project B3.1: Effects of Fire on Ecosystem Processes & Biodiversity  
Program B: Management of Prescribed and Wild Fires in the Landscape

## Background

Low intensity fires are used extensively in managed sclerophyll forests in Australia, reducing fine fuel levels so as to improve the success of fire-fighting operations. Leaf-litter accumulates rapidly in many of these forest systems, with fine fuel levels representing a dynamic balance between accumulation and decomposition of dead plant material. Litter-dwelling animals (e.g. beetles, landhoppers, millipedes, mites, springtails) are potentially important decomposers of fuel on the forest floor and also a major component of biodiversity. We know that frequent fire can impact upon the composition of these invertebrate communities, but we **don't know** how this effects fuel accumulation and decomposition, nutrient cycling and associated forest productivity.



## Methods

Eighteen sites are being studied that represent three fire regimes; (a) long-term unburnt (40+ years fire exclusion), (b) long-term unburnt with fire recently applied, and (c) long-term frequently burnt (fire every 3 years). By burning a set of long-unburnt sites and comparing them with frequently burnt sites we have effectively controlled for the potentially confounding effects of time-since-last-fire and differences in accumulated leaf-litter biomass (see above graph).

At each site twenty bags filled with 10 g of leaves were placed amongst the litter. Ten bags were constructed of 8 mm mesh and ten were of 0.2 mm mesh (see below).



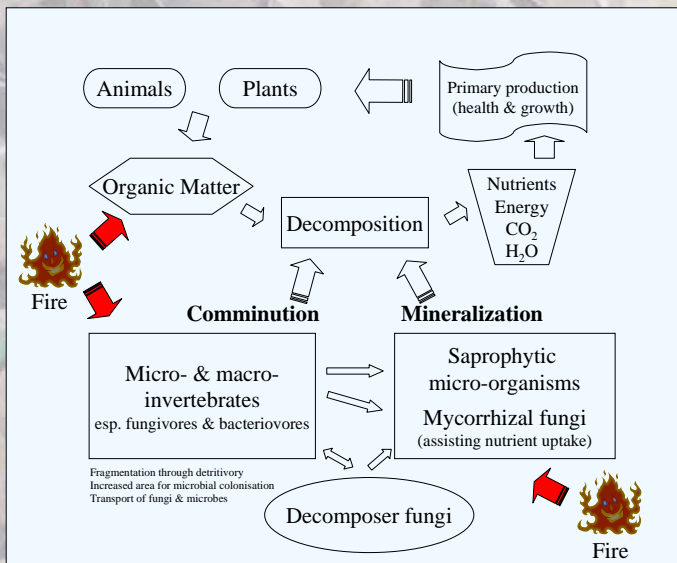
The large coarse mesh bag (left) allows all organisms to enter, while the fine mesh bag (right) excludes litter-dwelling animals but still allows decomposition by micro-organisms (fungi and bacteria).

**This research will enable 2 basic questions to be tested:**

1. What role do litter-dwelling organisms have in fuel accumulation and what is the effect of frequent fire?
2. What is the independent role of invertebrates and micro-organisms in litter decomposition and is the effect of fire different for each group?

## Acknowledgements

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A generalised model of energy and nutrient flow in ecosystems, highlighting the roles played by micro- and macro-invertebrates, saprophytic and mycorrhizal fungi.

## This Project

The experiment described here will provide a critical test of the effect of these organisms on the accumulation and decomposition of fuel, the cycling of carbon and nutrients, and its interaction with prescribed fire. Currently this information is lacking but is required by fire managers for ecologically sustainable forest management. This is because the long-term productivity of forests is dependent upon the biota that are responsible for decomposition (fungi and micro-organisms) and nutrient uptake (eg. mycorrhizal fungi), and their interaction with soil and litter invertebrates.

Litter-dwelling animals interact with other organisms by feeding on them and modifying their soil environment. In doing so, litter-dwelling animals can influence how nutrients are cycled through ecosystems. But it is currently unknown how different fire regimes alter the contribution of litter dwelling animals to the rate at which fuel decomposes on the forest floor. It is also not known how C:N ratios and plant growth might be altered by litter-dwellers.

This experiment commenced in May 2005, with initial results expected by early 2006.