

*Stoichiometric patterns in the responses of organisms, ecosystems and landscapes to fire.*

## **Litter fauna responses to frequent burning in Peachester State Forest**

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Adjunct/External Supervisors: Dr Tom Lewis & Professor James J. Elser

# Background

- Research focus: the interactions between biogeochemical effects of fire, and the effects of fire on organisms and their communities

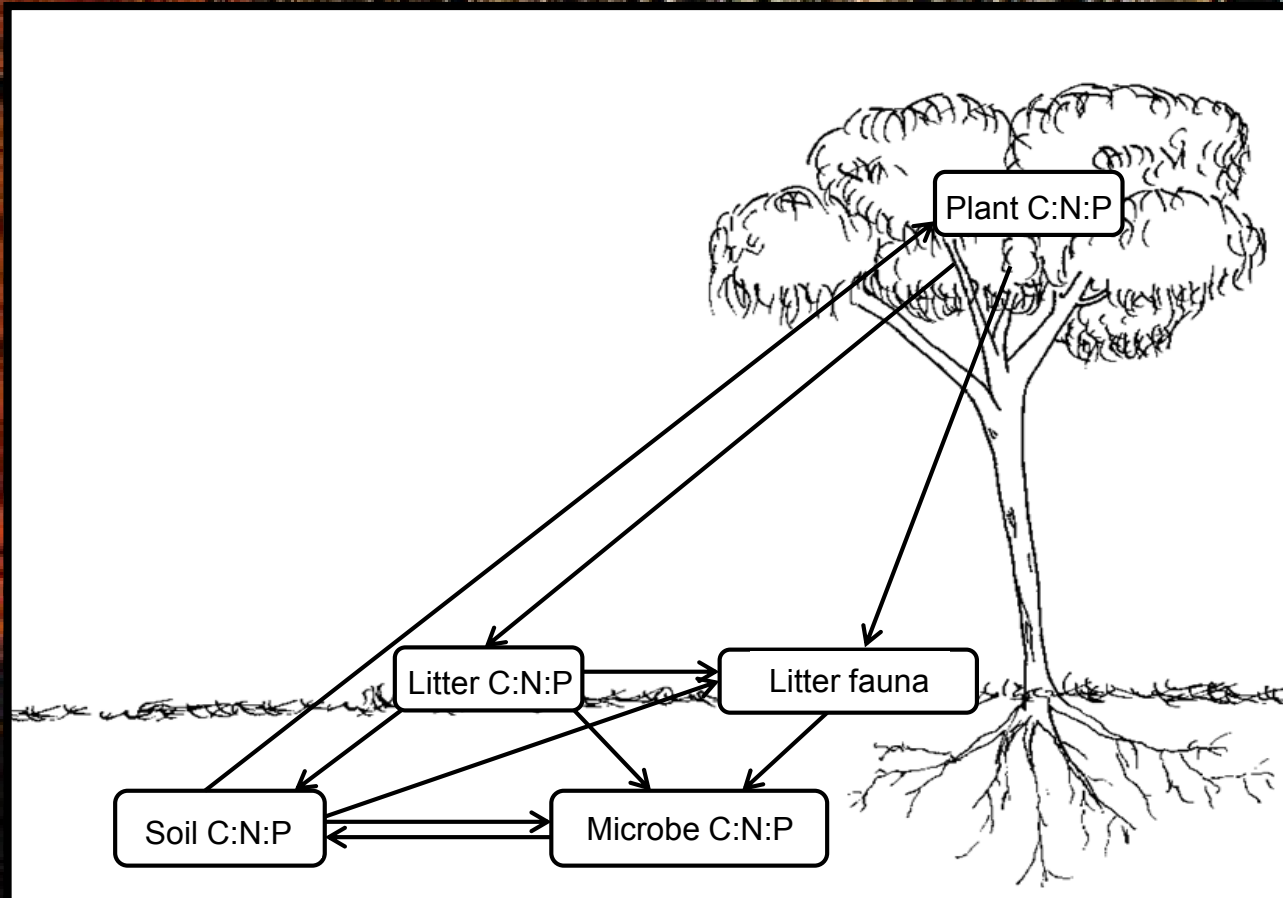
Biogeochemical  
cycling of C, N & P

My project

Plant, animal  
& microbial  
communities

# Background

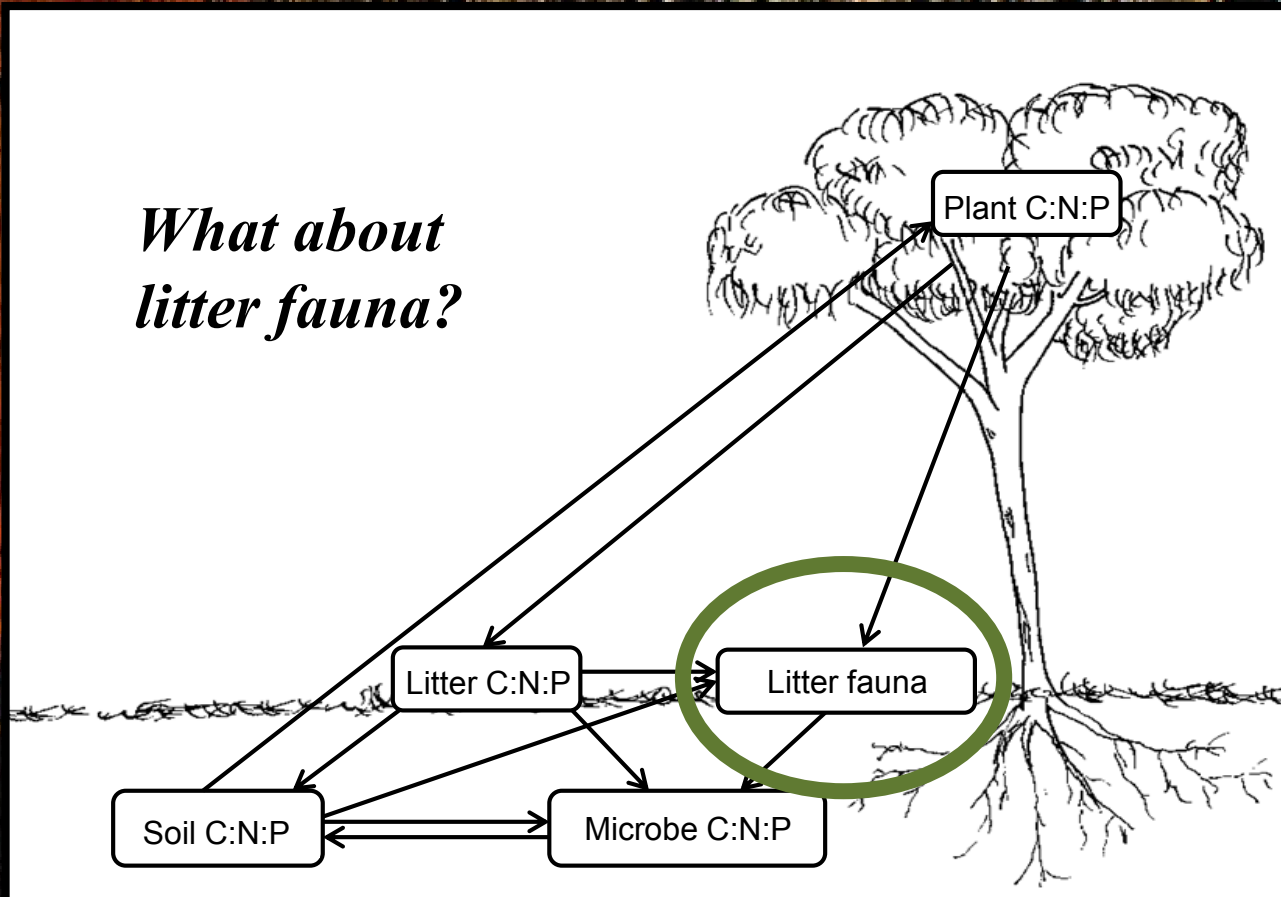
- Fire can alter the balance of carbon (C), nitrogen (N) and phosphorus (P) in soil (i.e. soil C:N:P ratios), leaves and litter



# Background

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*What about  
litter fauna?*





# Background

- Soil and litter invertebrates are extremely diverse.
- Invertebrates are useful indicators of overall forest health.
- Litter fauna contribute to litter decomposition rates, thereby influencing future fuel loads.



# Fauna Experiment

## *Summarised research question & hypothesis*

**Question:** How does repeated burning affect litter fauna communities?

**Hypothesis:** Repeated prescribed fire will alter litter fauna communities in the "recovery phase". Some of these changes will be related to litter C:N:P ratios.

# Fauna Experiment

## *Methods*

- Field trial at Peachester State Forest with 3 burning frequencies (2yB, 4yB, NB).
- Sampled soil, litter and litter fauna (pitfall traps) from 2yB and NB treatments in March 2015.
- Analysed soil and litter for C, N and P.
- Sorted major fauna orders to morphospecies level.



# Preliminary results – all fauna

- Major groups in pitfall traps were flies, beetles, spiders, ants and springtails (collembola).



**Coleoptera**  
(beetles)



**Diptera** (flies)



**Formicidae** (ants)



**Collembola**



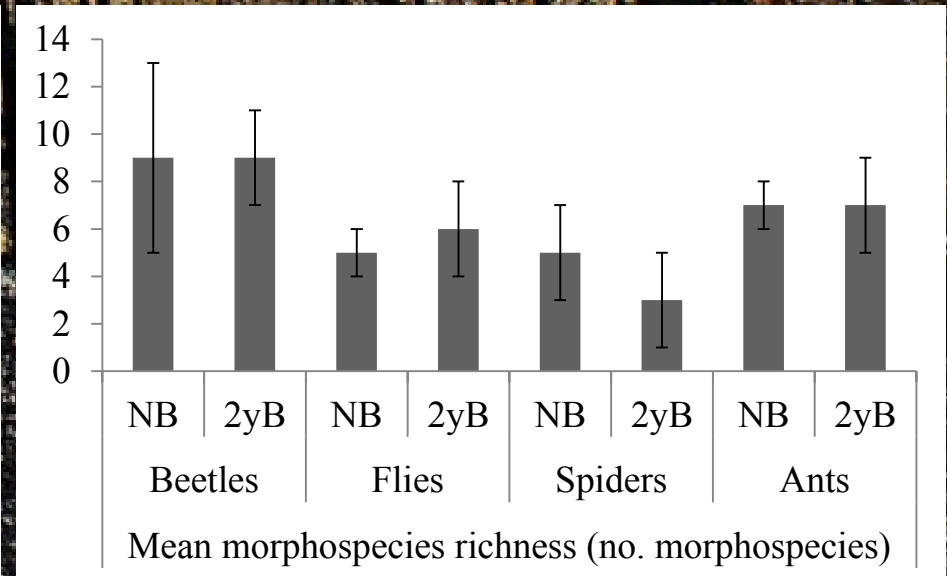
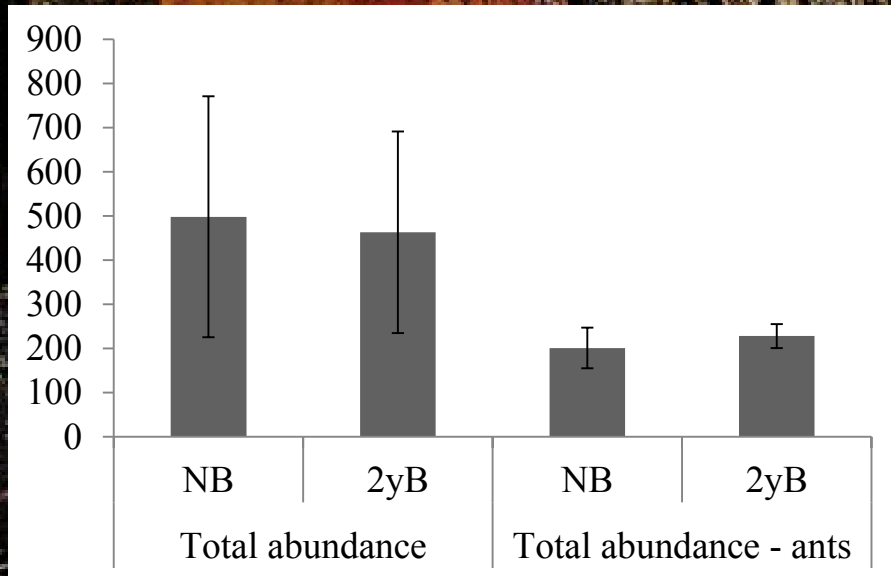
**Araneae** (spiders)





# Preliminary results – all litter fauna

- Mean total abundances and morphospecies richness not significantly affected by burning (resilient communities?)



# Preliminary results - Coleoptera (beetles)

- Frequent burning did not affect the mean diversity (Shannon index) of beetles.
- However, the morphospecies were different between 2yB and NB (Sørensen similarity index,  $QS = 0.68$ )





# Preliminary results – Diptera (flies)

- Frequent burning reduced mean Diptera pitfall trap diversity ( $P = 0.039$ )
- Diptera morphospecies were very different between the two treatments ( $QS = 0.40$ ).





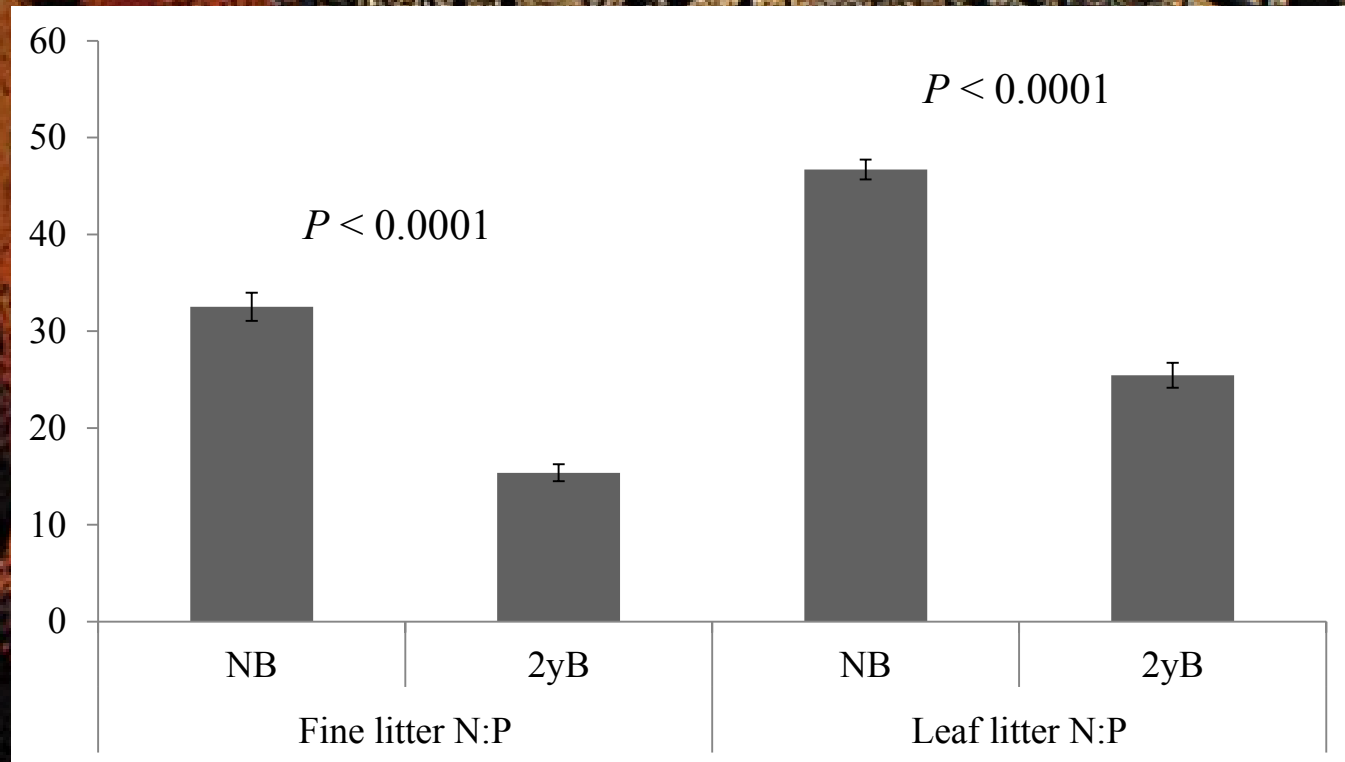
# Preliminary results – Araneae (spiders)

- Frequent burning reduced mean Araneae pitfall trap diversity ( $P = 0.02$ )
- Araneae morphospecies were very different between the two treatments ( $QS = 0.13$ ).



# Preliminary results – litter N:P ratios

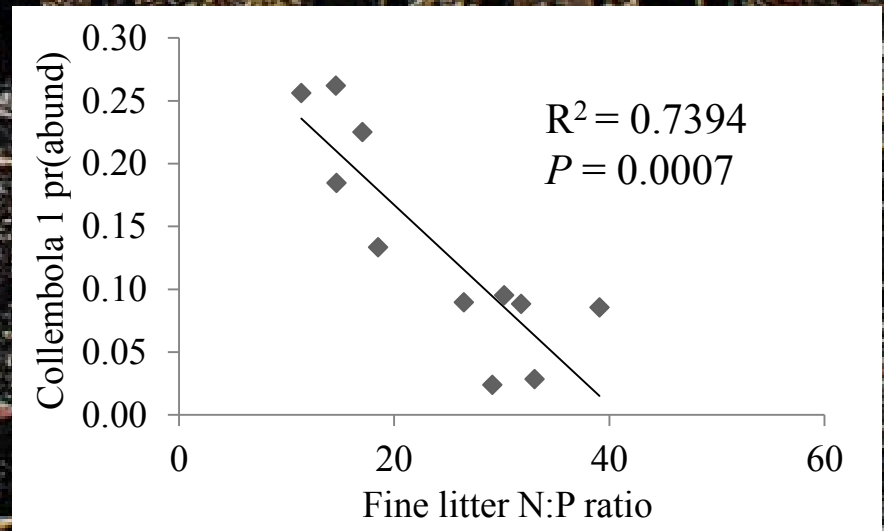
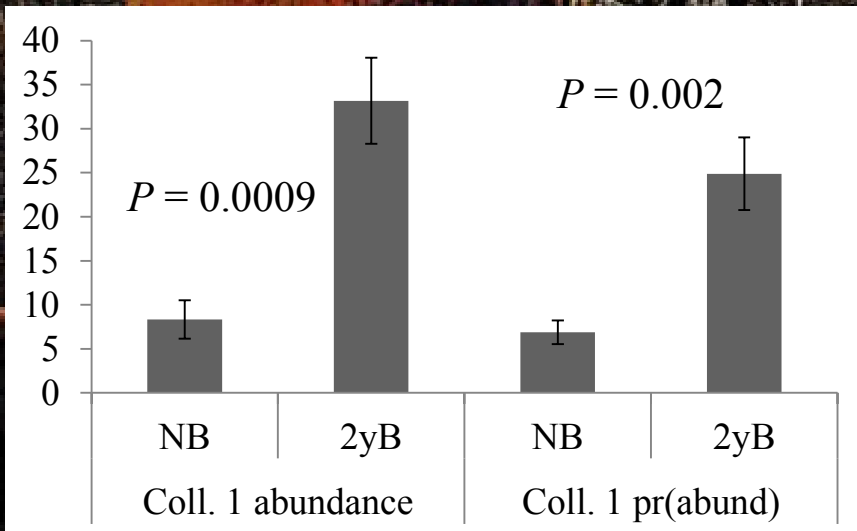
Frequent fire reduced soil and litter N:P ratios significantly, consistent with previous findings at Peacchester (N = 12).



# Preliminary results – Litter & fauna relationships

## Example result:

- A particular Collembola morphospecies was more abundant in 2yB. Abundance was inversely related to litter N:P.





# Preliminary results – litter N:P ratios

- Stoichiometry is useful for studying fire/biogeochemistry/organism relationships
- Frequent fire didn't seem to affect litter fauna in a negative way.
- Fire reduced spider and fly diversity to an extent, and altered the morphospecies composition of all major groups.
- Some relationships between fire's effect on litter C:N:P stoichiometry and fire's effects on litter fauna are apparent
- More to come!

Thank you!