




PROGRAM B

→ **The effects of frequent burning on nutrient cycling and insect herbivory: implications for forest health**

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PROGRAM B 3.1 Frequent burning and insect herbivory

→ **Ecosystem health**  
 Resilience, Vigour, Stability, Biodiversity,  
 Disturbance, Sustainable, Economically viable,  
 Productive




Photo: Dieter Hochuli

**Indicators of health**  
 Type, level and extent of insect damage in dominant plant species

**Black Slug Moth**



## Insect herbivory

1. Can have significant impacts on forest health and economic returns
2. Strongly correlated with leaf nutrients, particularly nitrogen
3. Outbreaks of pest insects associated with an imbalance in ecosystems or a sign of poor "health".
4. Associated with high stress environments such as those undergoing frequent disturbance events



## Objective

Determine the effects of long term frequent fire on leaf nutrients and insect damage of *Eucalyptus pilularis* forests in Northern NSW

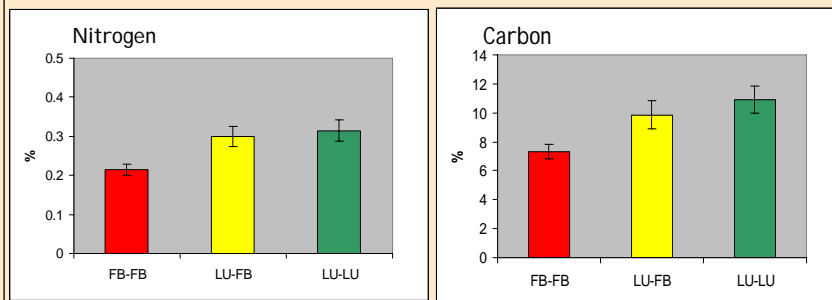


→ **Experimental Design**

1. Long Unburnt (LU)  
fire excluded since 1970
  2. Long Unburnt/Burnt (LU-B)  
fire reintroduced in 2000 on 3 yr rotation
  3. Frequently Burnt (FB-FB)  
prescribed fire every 3 years since 1970
- N=6

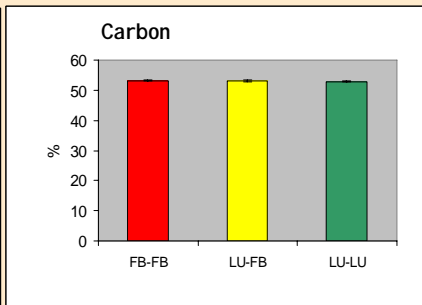
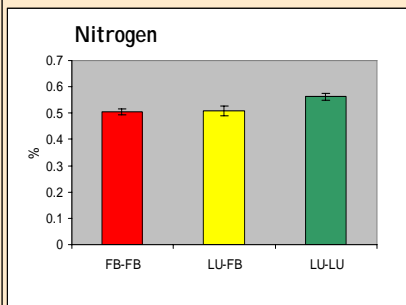


→ **Soil (0-5cm) - nutrients**





## Leaf Litter - nutrients

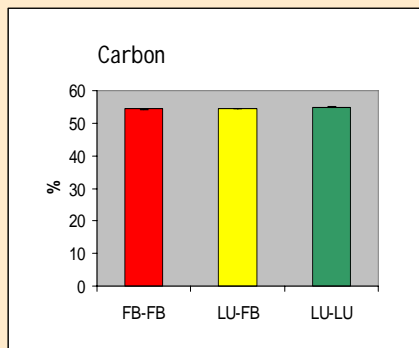
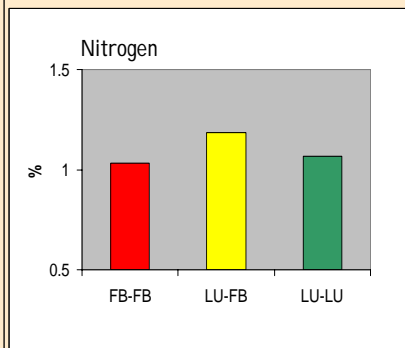


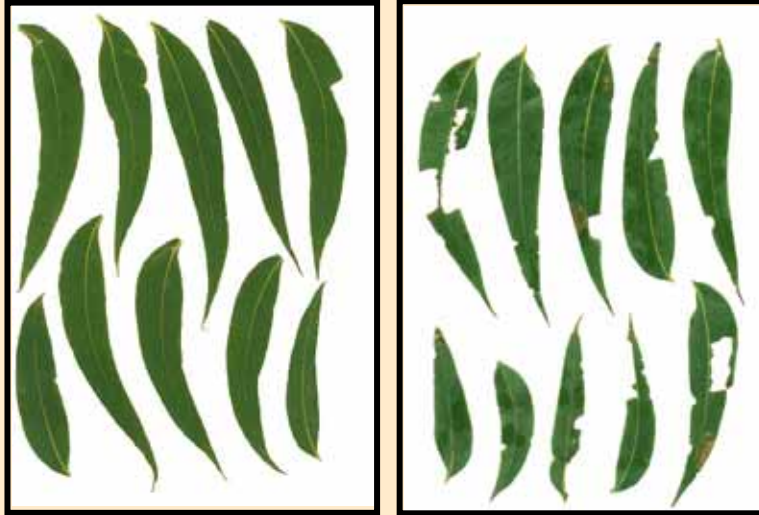
## → Canopy sampling

- 500 leaves each site
- 9000 leaves total
- Nutrient analysis
- Image analysis

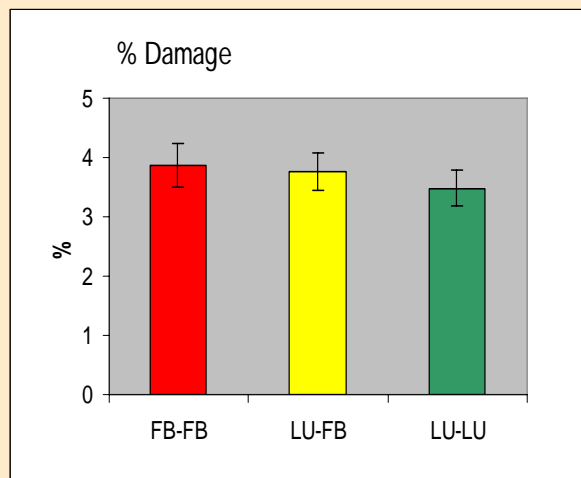


## → Canopy leaves - nutrients





### Canopy leaves - herbivory





## Conclusions

- General trend for N depletion in frequently burnt sites in soil, litter & canopy leaves
- However, no effect of frequent burning on levels of insect herbivory
- Frequent burning has not significantly affected this component of forest “health”



## Final points...

- Low site quality - nutrient limited
- Degree of resilience
- Environments with multiple stresses may show greater impacts
- Long-term studies provide important insights for predicting the effects of fire on nutrient cycling and ecological processes