Fire – Forest Friend or Foe

Investigating the Effects of Fire Regime on Forest Dieback

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Introduction:

Forest dieback currently affects approximately 500,000 ha of NSW coastal forests. Forecasts indicate that up to 2.5 million ha may eventually become affected in NSW.

Reduced incidence of low intensity fire due to fire suppression activities has been suggested as a possible cause of forest dieback. This is thought to be through an altered soil environment (nutrients, moisture, soil microflora) under situations of historically low fire frequency (Figure 1).

Aims

This research will investigate:

- •is canopy health in dry eucalypt forests affected by fire regime?
- •Is charcoal in litter and topsoil a useful indicator of recent fire regime?
- •Do nutrient cycling processes differ between dieback-affected and healthy forests?
- •Do soil microflora populations differ between dieback-affected and healthy forests?
- •Does foliar chemistry differ between dieback-affected and healthy trees? May this be contributing insect outbreaks in dieback-affected forests? Can foliar chemistry be used as a measure of dieback.

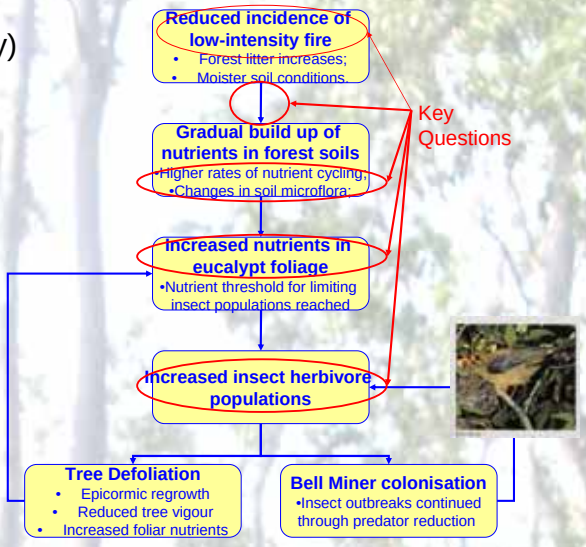


Figure 1: reduced fire incidence / nutrient increase model of eucalypt dieback

Study Locations

1. Richmond Range State Forest / National Park - Richmond Range Spotted Gum Forest Type (Figure 2).
2. Bauple State Forest Long Term Fire Trial (Figure 3).

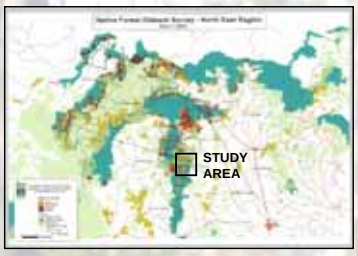


Figure 2: Location of the Richmond Range Study Area. Produced by the SFNSW Forest Health Survey Unit, under commission from the BMAD working group.

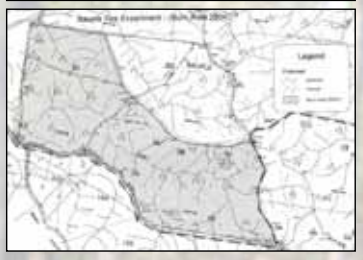


Figure 3: Bauple Long-term fire management trial.

cpt. 21 – annual burn;
cpt. 19 – triennial burn;
cpt. 20 – control (no burn)

Methods

Richmond Range:

- •Plot locations selected to cover a range of dieback severity, with vegetation, soil, topography and climate constant;
- •Canopy health assessed using canopy photography and visual dieback assessment (figure 4);
- •Soil sampling using Ion Exchange Resin Cores (Fig 5) to determine soil pools and fluxes of plant available Nitrogen and Phosphorus;

Litter-trap sampling to describe nutrient transfers from the canopy;

Foliar sampling to estimate leaf chemistry & insect herbivory.

Bauple:

- •Canopy health by fire regime will be assessed using canopy photography and visual dieback assessment (figure 4);
- •Soil charcoal will be analysed using MIR to determine charcoal profiles of different burning regimes

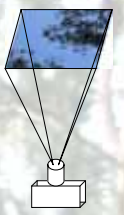


Figure 4: Canopy photography

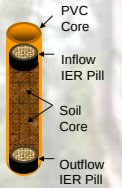


Figure 5: Ion Exchange Resin Core

Expectations

Nutrient pools and flux rates in soil under dieback forests will increase as dieback advances.

Foliar nutrition and insect populations will follow soil nutrient increases.

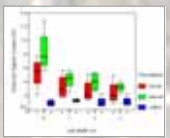
Observed soil nutrient changes will be linked to a relative absence of low intensity fire.

Soil nutrients will continue to increase as dieback advances and the nutritional quality of litter improves. These increases will drive faster nutrient cycling processes.

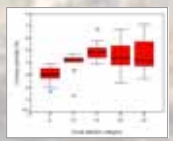
Soil nutrient changes will support the proposal that soil nutrient increases may have a detrimental effect on the health of canopy trees adapted to low nutrient conditions (i.e. eucalypt forests on sites with, historically, frequent low intensity fires), through enhancements in foliage quality and improvements in survival of insect herbivore populations.

Preliminary results

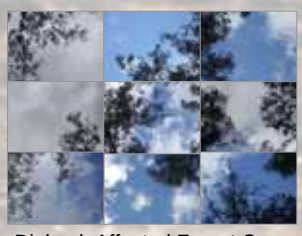
Analysis of soil samples from the Bauple Fire Trial suggests that quantity of soil charcoal in litter and upper soil may be a good indicator of recent fire activity.



Canopy photography appears to offer an efficient and objective measure of dieback severity.



Healthy Forest Canopy



Dieback Affected Forest Canopy

Acknowledgements

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