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Previous (/wr/WR13202) | Next (/wr/WR14050) Contents Vol 41(3) (/wr/issue/7171)

Interactions between the superb lyrebird (*Menura novaehollandiae*) and fire in south-eastern Australia

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Abstract

Context: The superb lyrebird *Menura novaehollandiae* is thought to be an important ecosystem engineer that, through its foraging, accelerates the decomposition of litter in *Eucalyptus* forests. Lyrebird foraging is therefore likely to affect forest fuel loads and hence fire behaviour in these fire-prone forests. In turn, fire is likely to reduce the abundance and influence the distribution of lyrebirds.

Aims: Our goal was to determine the impacts of a major bushfire on the habitat and food sources for the superb lyrebird and the effects of foraging activities of lyrebirds on litter fuel and potential fire behaviour in gullies of herb-rich foothill forests.

Methods: The effect of fire on lyrebirds and their habitat in the post-fire environment was examined at the landscape-scale, 2 years after fire; and at the patch-scale, 3 years after fire. Paired exclusion and control plots were also used over a 9-month period to assess the effects of foraging by the lyrebird on litter accumulation and fuel connectivity. Fire-behaviour models were used to determine the potential influence of lyrebird scratchings on fire behaviour.

Key results: At the landscape scale, lyrebirds were present in both unburnt and ground-burnt sites, but not in canopy-burnt sites. Within patchily burnt sites, lyrebirds favoured foraging in unburnt patches. On average, lyrebird foraging reduced litter fuel loads by 25% (1.66 t ha^{-1}) in plots in which they were free to forage, compared with plots from which they were excluded, over a 9-month period. Fire-behaviour modelling showed that lyrebird foraging led to a lower likelihood of fire occurring and less intense fire.

Conclusions: Distinctly different vegetation structure and composition between burnt and unburnt patches appears to influence both the foraging patterns and distribution of lyrebirds. Additionally, foraging by lyrebirds reduces surface fuel loads and fuel connectivity such that fire spread is likely to be inhibited.

Implications: We propose that alternative stable states may emerge in *Eucalyptus* forests as a result of feedback mechanisms among lyrebirds, vegetation and fuel accumulation. Therefore, the ecological role of lyrebirds is an important consideration in forest fuel management and conservation in these extensive, fire-prone forests in south-eastern Australia.

Additional keywords: alternative stable states, disturbance ecology, fire, forest fuels, lyrebird.

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About the Journal
Editorial Structure
Publishing Policies
Contacts

CONTENT

Online Early
Current Issue
Just Accepted
Most Read
All Issues
Special Issues
Virtual Issues
Sample Issue

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General Information
Scope
Submit Article
Author Instructions
Open Access

FOR REVIEWERS

Reviewer Guidelines
Review Article
Reviewer Recognition
Annual Reviewer Index

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Customer Service
Print Publication Dates
Library Recommendation

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