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Abstract

Biodiversity in Fire Risk Analysis: Response of Plant Viability to Demographic Shifts in Fire-Prone Australian Forests †

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Abstract: Fire regimes are changing around the world. Fire seasons are lengthening, with high-severity fires occurring more often and in unexpected places. There are continued challenges in predicting future fire regimes; however, it remains crucial to understanding the ongoing risks to biodiversity, life, and property. Extensive research examines some of the risks to life and property. However, in the fire risk research space, there is often a limited or simplified inclusion of ecological values. Future fire regimes, alongside climatic change, could have profound impacts on biodiversity conservation and ecosystem functions. By having a better understanding of how fire regimes may change, we can predict some of these impacts and either manage for them or facilitate the shifts depending on the risks and impacts involved. In our study, we developed a simulation framework to examine how variation in plant traits influences the viability of populations under future predictions of fire regimes and demographic shifts. Our framework combines a landscape fire regime model which simulates fire over decades to centuries, coupled with a spatially explicit population viability analysis. We applied this approach to plant populations in temperate forest ecosystems in south-eastern Australia to better understand: (1) which functional types are most vulnerable under predicted changes, and which traits contribute most to vulnerability; and (2) which components of future fire regimes and changing climate pose the greatest risk to different plant functional types.

Keywords: climate change; fire regime; forest; biodiversity; wildfire; risk analysis; functional types

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