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Non-linear changes to future fire in forests and grasslands

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Understanding the drivers of fire extent across landscapes is fundamental to examining fire management effectiveness under current and future fires. Fire occurrence and extent (area burned) is argued to be a function of four key drivers – ignitions, fire weather, biomass and fuel availability. Many studies have sought to examine the role of one or two drivers, but to our knowledge no studies have sought to examine the relative important of each driver on fire occurrence and the other drivers. Here we present a sub-continental analysis of fire occurrence and extent from southern Australia accounting for all four drivers and the interactions therein. In forest systems, the occurrence of fire is positively related to fuel variables (load and availability). Similar results were seen for extent with the added negative influence of ignitions. In grassy systems, fuel availability was the primary driver for both occurrence and extent. Fuel treatments had a modest effect on reducing the occurrence and extent of fires in forests, despite the importance of fuels in these models. Changing climates are predicted to have varying effects. In forests, the model predicts an increase in the average extent but not the maximum extent of wildfires suggesting an increased burn frequency. In grasslands, an overall decrease in fire activity is predicted. The assumption is that all drivers change at the same rate which is not correct. Climate changes will outstrip vegetation changes and therefore we would predict increased fire occurrence and extent before reaching the new normal: i.e. a possible non-linear trajectory of fire in the future.

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