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Drivers of Wildfire Occurrence Patterns in Wetlands of Riverine Bioregion in New South Wales, Australia

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In inland wetlands in Australia, wildfires not only threaten human lives and cause economic loss as in other landscapes but also injure or kill fire-sensitive wetland species such as river red gums. Therefore, understanding of the drivers regulating wetland wildfire occurrence patterns is vital from the perspectives of fire risk reduction and ecosystem management. There are currently very few published quantitative studies characterising wildfire occurrence in inland wetland areas in Australia. This study aims to address the following questions in a quantitative way: What determines the occurrence of inland wetland wildfires, and are these factors different compared with those in other ecosystems? Which factors play more important roles than the others?

In this study, historical wildfire records over the period of 1970-2016 and across the Riverina bioregion of New South Wales (NSW) are sourced from a number of fire management agencies, with lightning- and human-caused fires being analysed separately. Bivariate and multivariate Generalized Linear Models (GLMs) are developed to understand top–down (weather) and bottom–up (vegetation and ignition source) factors acting on the patterns of wetland wildfire occurrence. The relative importance of these factors is evaluated based on their contribution to the final model.

Fires are expected to be less likely to start from wetlands than other landscapes since the fine fuel loads are generally low and fuels are usually too moist to burn. However, prolonged drought can increase the probability of wetland wildfire occurrence due to the drying out of the understory fuels. Fires are intuitively less likely to occur at the inundation area or during flooding periods. The relationship between fire occurrence probability and flood frequency is expected to be non-linear, with fire probability being the highest at intermediate flooding frequencies because flooding of different frequency regulates biomass accumulation and fuel moisture in different ways. As in other landscapes, lightning fires are expected to ignite from remote areas while human-caused fire probabilities are higher in the areas close to infrastructures. Drought and flooding are expected to be more important than other factors considering their relationship with fuel status in such a semi-arid wetland ecosystem. This research has the potential to provide information on sustainable wetland management policy making and fuel reduction planning in inland wetland areas.