



Abrupt and severe 20th Century changes in the fire regimes of southeastern Australia: Evidence from a 3000 year multi-proxy analysis

Patrick Baker (1), Scott Mooney (2), Kathryn Allen (1), and Timothy Willersdorf (1)

(1) School of Ecosystem and Forest Science, University of Melbourne, Victoria, Australia (patrick.baker@unimelb.edu.au),

(2) School of Biological, Earth and Environmental Sciences, University of New South Wales, NSW, Australia

Fire is the dominant natural disturbance in southeastern Australia. For millennia it has been the driving force shaping terrestrial ecosystems in the region—simultaneously killing vegetation and initiating regeneration across whole landscapes. Fire regimes across the region are driven by several factors including climate, vegetation, and ignition sources. Humans have been a significant contributing factor to past and present fire regimes. Prior to European settlement in the late 1700s, Aboriginal Australians used frequent, low-intensity fires to manage vegetation across much of the landscape. European settlement led to the displacement of Aboriginal communities and a shift to active fire suppression and control. This changing approach to fire management is widely believed to have initiated a fundamental shift towards extreme, high-intensity fire events as fuel loads increased. In addition, during the 20th Century prolonged periods of warm, dry conditions have occurred with greater frequency and intensity. The relative importance of climate and fire management practices on contemporary fire regimes is vigorously debated in Australia and is directly relevant to land management policies and their implementation. To put the current fire regime into historical context, we used a multi-proxy approach combining palaeo-charcoal and tree-ring analyses to assess how fire regimes have changed over the last 3000 years in the Snowy Mountains region of southeastern Australia. We found almost no evidence of high-intensity fires in the 3000 years that preceded the 20th Century. However, in the mid-20th Century there is a sudden and dramatic increase in the presence of charcoal and the pulsed establishment of trees across the landscape, suggesting a recent shift from low-intensity fires with minimal charcoal signatures to moderate- to high-intensity fires with substantial charcoal inputs. Importantly, the tree-ring data demonstrate that most of these fires were not stand-replacing and led to the establishment of multiple-age cohorts. While there is a clear shift in the fire regime in the 20th Century, the intensification of fire occurs nearly 150 years after European settlement in this area and has led to the establishment of complex, multi-aged forests across the landscape, suggesting an important interaction between fire management practices associated with European settlement and changing climatic conditions.