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Monitoring wood formation dynamics of *Pinus pinaster* Aiton in a burned area of Vesuvio National Park

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Forest fires are becoming more intense and recurring due to climate change and are increasingly threatening the integrity and functionality of forests worldwide. Trees' resilience is closely influenced not only by direct fire damages, but also by pre-existing climate stress conditions, such as high temperatures and water deficit. Fire wounds and extreme climate events can impair plant physiology triggering tree mortality in the medium and long term. Therefore, understanding the links between fire, climate and tree health is essential to anticipate the impacts of global warming and to plan climate-adapted forest management strategies. In this context, our research aims to study the post-fire effects on a *Pinus pinaster* Aiton forest growing in Vesuvius National Park, a particularly drought prone area in Southern Italy, comparing plants with severe damage to the canopy with non-defoliated trees. We combined inter-annual analyses of dendrochronology, carbon and oxygen isotope composition in tree rings, and intra-annual monitoring of xylogenesis to explore the effects on tree-growth, ecophysiological processes and wood formation dynamics. The tree-ring approach showed that crown damage compromised the photosynthetic activity of burned trees, with a decrease in tree-growth in the medium term compared to control trees. Moreover, the xylogenesis analysis demonstrated a delay in phenology and a lower xylem productivity and plasticity of the defoliated trees, as well as the negative influence of hot and dry months on cambial production. Our findings suggested that although maritime pine can survive severe forest fires in the short term, a severe crown defoliation and prolonged drought conditions can compromise the species' eco-physiological functions reducing the chances to regain the pre-disturbance productivity rates.