

Extreme fire spread events burn more severely and homogenize postfire landscapes in the southwestern United States

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Extreme single-day fire spread events are associated with warmer and drier fire seasons and are expected to increase in the future. However, our understanding of the post-fire landscape outcomes of such events is limited. Here, we ask whether extreme events burn more severely or produce landscape patterns that are less conducive to forest recovery. To identify extreme single-day fire spread events, we used satellite fire detections to create day of burning (DOB) maps for 633 fire events >400 ha within forested ecoregions of the southwestern United States. We categorized daily rates of spread as extreme (top 2.5% of events; >4901 ha/day) and non-extreme (bottom 97.5%, <4901 ha/day). We contrasted satellite-measured burn severity and a suite of high severity patch landscape metrics between extreme and non-extreme spread events. We found that extreme single-day fire spread events were associated with increased severity, a greater proportion of area burned severely, and a higher percentage of like adjacencies between high severity pixels. Average distances from high severity patch interiors to edges were also greater in extreme single-day spread events. Additionally, area-weighted mean patch size and total core area of high severity patches were higher for fires containing one or more extreme single-day spread events. Larger and more homogenous high-severity patches produced during extreme events have been shown to limit tree seedling establishment, inhibiting forest recovery and facilitating vegetation type conversion. These landscape outcomes are expected to be magnified under future climate as extreme fire spread becomes more prevalent, accelerating fire-driven forest loss across the southwestern US.