The Role of Climate and Vegetation Change in Shaping Past and Future Fire Regimes in the Northwestern U.S. and the Implications for Ecosystem Management

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Abstract

Fire is an important part of the disturbance regimes of northwestern U.S. forests and its role in maintaining and altering forest vegetation is evident in the paleoecological record of the region. Long-term reconstructions of Holocene fire regimes, provided by the analysis of charcoal, pollen, and other fire proxies in a network of lake records, indicate that the Pacific Northwest and summer-dry regions of the northern Rocky Mountains experienced their highest fire activity in the early Holocene (11,000-7,000 years ago) and during the Medieval Warm Period (ca. 1,000 years ago) when drought conditions were more severe than today. In contrast, in summer-wet areas of the northern Rocky Mountains, the period of highest fire activity was registered in the last 7,000 years when dry woodland vegetation developed. When synthesized across the entire northwestern U.S., the paleoecological record reveals that past and present fire regimes are strongly controlled by climate changes occurring on multiple time scales. The scarcity of fires in the 20th century in some northwestern U.S. ecosystems may be the result of successful fire suppression policies, but in wetter forests this absence is consistent with long-term fire regime patterns. In addition, simulations of potential future climate and vegetation indicate that future fire conditions in some parts of the northwestern U.S. could be more severe than they are today. The Holocene record of periods of intensified summer drought is used to assess the nature of future fire-climate-vegetation linkages in the region.

Key words: fire history, charcoal records, Holocene climate change, future fire conditions, western U.S.