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# Global fire history of grassland biomes

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## Abstract

Grasslands are globally extensive; they exist in many different climates, at high and low elevations, on nutrient-poor and -rich soils. Their distribution today is closely linked to human activities, fire, and herbivores, but they have frequently been converted into urban areas, forests, or agriculture fields, depending on the region.

Roughly 80% of global fire activity takes place in grasslands each year, for management or for agriculture purposes, making fire a critical component of grasslands dynamics. Given that the locations of grasslands have changed over time, we compare fire history reconstructions based on alternative classification schemes highlighting: 1) sites from modern grassland locations; 2) sites that were likely grasslands during the mid-Holocene; and 3) sites based on author-derived classifications. We also compare the grassland fire histories with forested sites only (mid-Holocene classification) and a global biomass burning reconstruction.

Taken together, the reconstructions indicate that burning in grasslands has followed a different trajectory than burning in forests during the Holocene. Globally, grassland burning increased from the early to mid-Holocene, reaching a maximum about 8000-6000 years ago; it subsequently declined, reaching a minimum around 4000 years ago. In contrast, fires in forests tended to increase during the Holocene until about 2000 years ago.

Additional research focusing on calibration, integrated vegetation, climate, and fire history analyses, and model experiments could greatly improve our understanding of grassland fire globally. It is already evident, however, that the different trajectories of burning in grassland versus forests globally during the Holocene has large implications for understanding changes in the global carbon cycle, as well as biodiversity, conservation, and land management in grasslands.

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