



Fire, climate, and conservation in human-dominated landscapes

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Agricultural expansion and intensification have contributed to a 25% decline in global burned area in the past two decades, with concentrated losses of fire activity in savanna and grassland biomes. Reductions in burned area highlight distinct tradeoffs for management of natural and agricultural areas within human-dominated landscapes. Fewer, smaller, and less frequent fires present a challenge for conservation of open savanna and woodland physiognomies. In contrast, the move towards fire-free management of croplands and grazing areas may improve nutrient retention and forage availability while protecting tree crops, infrastructure, and public health. Climate change may also alter the balance between risks and benefits of declining fire frequency. For example, droughts and other climate extremes may reconnect fragmented landscapes, increasing the risk of fires spreading across both managed and unmanaged cover types.

Here, we examined the influence of agricultural expansion and intensification on fire activity in the Cerrado, a productive savanna and woodland biome covering 2M square kilometers in central Brazil. By law, 20% to 35% of private properties in the Cerrado must be set aside as a legal reserve of natural vegetation. Combining data from state and federal land registries with multi-scale remote sensing data, we characterized the frequency of fire activity on private reserve lands and protected areas in the Cerrado and concomitant changes in woody cover. Private and public reserve lands had inverted distributions of fire frequency, with infrequent fires on private properties and annual burning in protected areas. Patterns of fire activity differed sharply between drought (e.g., 2007, 2010, 2015) and non-drought years, altering cross-biome transport of biomass burning aerosols from the Cerrado to the Amazon. Our findings highlight the rapid transformation of fire activity in tropical savannas and the need for regional management solutions to promote conservation objectives on private reserve lands.