

Fire season and fuel load predict fire behavior in open savannas in Northern Cerrado

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ABSTRACT – Fire is one of the main factors determining the structure of mesic savannas like the Brazilian Cerrado. Its plant species have evolved with fire for millions of years, but intense human use in the past century has been threatening biodiversity. Until recently, the governmental strategy to cope with it has been fire exclusion, which leads to grassy fuel loading and intensification of late-dry season wildfires. A fire management program was established since 2014 in some Protected Areas (PA) to try to solve the problem, including a series of practices such as late-wet and early-dry season prescribed burns. However, the behavior of these fires had not been characterized prior to this study, so our aim was to do so to inform PA staff decision-making. We set up seven 50 x 100 m plots for each of the burning treatments: biennial early-dry season management fires (MF) and late-dry season fires (LF). Fires were lit in 2015 and 2017 in the same plots. For each burn, we calculated fire intensity, heat released, burn efficiency and flame height (only for 2017 fires). We fit linear models for each of these variables, considering fire season, pre-fire biomass, air humidity, wind speed and percentage of dicots in the fine fuel (only for 2017 fires) as explanatory variables ($p \leq 0.05$). We compared AICc values to select the fittest models for each parameter. Considering all fires, fire intensity and heat released were best explained by pre-fire biomass and fire season, whilst wind speed and fire season best explained burn efficiency. As for 2017 fires, fire intensity and flame height were best explained by fire season alone, while heat released and burn efficiency were best predicted by fire season, pre-fire biomass and dicot percentage. LF were more intense, consumed more fuel and released more heat than MF. This indicates that season, time since last fire and local conditions that facilitate fuel loading might all be crucial in determining fire behavior. Therefore, frequent (< 4 yrs.) prescribed burns in the early-dry season should be used to prevent the occurrence of intense wildfires in areas with quick fuel build-up.

Keywords: Fire regime; fire management; prescribed burns; intensity; wildfires

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