



Vulnerability of Amazonian floodplains to wildfires differs according to their typologies impeding generalizations

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Flores et al. (1) suggest that large Amazonian floodplains are vulnerable to fire and that a future, drier climate will trigger wide-spread conversion of floodplain forests into fire-dominated savanna. Furthermore, the authors argue that fires in fluvial networks will cascade through non-flooded communities and spearhead fire-induced change in the wider basin. We disagree with the reasoning, which we argue lacks a nuanced understanding of habitat diversity in Amazonian floodplains.

In their modeling approach, Flores et al. (1) do not distinguish between highly dynamic *várzea* and oligotrophic *igapó* floodplains. Estimates based on remote-sensing in the Amazon basin indicate that *várzea* covers a larger area ($456 \times 10^3 \text{ km}^2$) than *igapó* ($302 \times 10^3 \text{ km}^2$) (2, 3). Moreover, there are two distinct types of *igapó*: black-waters ($\sim 140 \times 10^3 \text{ km}^2$) and clear-waters ($\sim 162 \times 10^3 \text{ km}^2$). Current knowledge regarding fire and floodplain vegetation is biased exclusively toward black-water *igapós* (4, 5), which account for $\sim 15\%$ of Amazonian floodplains. For the great majority of Amazonian floodplains, scientific evidence of fire vulnerability is lacking.

The assumption that burned floodplain forests are more vulnerable to succeeding fire events due to increased biomass fuel and drier microclimate may be true for highly inundated *igapó* forest on sandy soils (5). However, this assumption is not for the *várzea*, with alluvial soils of dominantly fine-grained silts and clays, which reduce the potential for desiccation and thus vulnerability to fire. Furthermore forest succession and biomass accumulation occur much faster in the

várzea than in *igapó* and other Amazonian ecosystems (6, 7), resulting in a swift recovery of ecosystem structure and function. Among others, this finding reflects differences in species composition, with a floristic similarity of less than 30% between *várzea* and *igapó* at the scale of the Central Amazon, and a number of functional traits associated to the vegetation typical of *várzea* and *igapó*, such as differences in diameter and height growth, wood density, leaf morpho-anatomy, root stratification, and vegetative and reproductive phenology between both ecosystems (7–9).

Across the Amazon basin exists a spatial and temporal variability of climate-induced droughts (10) in relation to the periodicity of seasonal flood-pulses (8), both of which have strong implications for plant-water availability and fire vulnerability. For example, droughts induced by severe El Niño events (December–March) coincide with low-water periods of the middle-upper Negro River, Branco River, and other Guyana Shield tributaries dominated by *igapós*. In contrast, *várzea* floodplains are mainly located in the southern hemisphere and are less vulnerable due to already increasing water levels in this period, potentially buffering vegetation from climate-induced drought and fire hazard.

In sum, the modeling approach of Flores et al. (1) is founded on broad assumptions regarding the vulnerability of floodplains to wildfires, which unfortunately do not reflect our current understanding of Amazonian floodplain diversity. Scientific evidence of fire vulnerability in *várzea* is lacking, and extrapolating results from a selection of *igapó* sites is unjustified.

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