



Simulating the effect of fire frequency on the vegetation biomass and carbon emissions in the Brazilian savanna: BEFIRE model

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ABSTRACT – The Brazilian Cerrado is the savanna with the greatest biodiversity in the world. The adequate definition of fire frequency is a key factor for the success of savanna management, since frequent fires and in a short time interval may prevent the recovery of the vegetation, while in the absence of fire the vegetation may become more dense and homogeneous. We use a Systems Dynamics approach to demonstrate how fire frequency can affect vegetation biomass and the carbon emissions associated with the fine fuel consumed in Brazilian savanna (typical cerrado physiognomy). We built the BEFIRE (Behavior and Effect of Fire) model based on an extensive review of the literature on prescribed burns in the Cerrado. The inputs of the BEFIRE model were rates of increase and decrease of biomass from different vegetation strata (trees, shrubs, herbs and grasses). The outputs were the effects of fire on the temporal dynamics of vegetation biomass and carbon emissions from fine fuel consumed. We simulated two fire frequency scenarios: single fire and biennial fires. Our simulations showed that biomass recovery from herbs and grasses is not affected by biennial fires. However, this time interval does not allow the recovery of biomass from shrubs and trees and the uptake of carbon emitted during the passage of fire. Thus, fire intervals of less than four years are not recommended for the conservation of the Brazilian savanna structure, as may be altered the co-existence of the trees/shrubs and herbs/grasses that characterize the typical cerrado physiognomy.

Keywords: Carbon emitted; fire management; prescribed burns; vegetation recovery

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