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How forest fires affect structure and species composition of Peruvian tropical montane cloud forests?

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Fire is a major agent of disturbance in most biomes of the world, with direct and indirect effects on their structure, species composition, nutrient cycles (especially C and N) and soil properties. Although effects of fire have largely been studied on most ecosystems of the world, its role on the highly biodiverse tropical mountain cloud forests (TMCFs) of the Andes has not been addressed. One of the reasons is that they have been traditionally considered as fire independent ecosystems because their permanent moist conditions do not enable fire to spread. But human pressure and traditional use of fire, together with an increased aridity (driven by rising temperatures and evapotranspiration, and longer dry seasons) have increased fire occurrence. Future climate scenarios are not optimistic, as predict a future warmer and drier climate in the Andes. Therefore, fire is likely to become a common perturbation agent in TMCFs. This study analyzes the effect of fires in the forest structure and species composition of 10 different TMCFs sampled between April and October 2010. At each of the 10 sites, we set up plots on burned and nearby unburned forests, having a total of 10 unburned plots and 12 burned plots (in two sites we selected two burned forests with different time since last fire). Additionally, we classified burned forests as: recently burned (RC, 0-5 years since last fire); medium-time burned (MB, 5-10 years since last fire), long-time burned (LB, more than 10 years since last fire). When choosing the control and burnt plots we assumed that forest structures were similar previous to fire disturbance, and that any changes in forest structure and species composition were related to the impacts of fire. At each plot we tilled all dead and live trees and shrubs with DBH > 2.5 cm and measured height, basal area, looked for fire scars and their regenerative strategy (resprouting, germination). All trees were collected to be identified to the genre level and, when possible, to the species level. Woody debris was sampled using the linear intercept method. Differences in species diversity will be assessed through the Shannon diversity index and the Sørensen index of similarity. Differences in forest structure and will be tested with the non-parametric Wilcoxon-test matched paired test. We expect to find significant effects of fire in both forest structure and species diversity, with high-mortality levels and a significant decrease in species diversity after fire in RC plots, low-mortality rates and an increase in seedlings (but a not a significant increase on species diversity) on MB plots, and low-mortality rates and increase in diversity (but not reaching unburned plots levels) in LB plots. We also expect to find a decrease in woody debris in RC forest, but a significant increase in woody debris in MB and LB. The implications of changes on forest structure and species composition will be discussed in the context of future climate scenarios.