Background: Variation in the distribution and abundance of woody plants as consequence of disturbances such as fire may be explained by lineage age.

Aims: We tested whether lowland tropical tree lineages that colonise secondary forests are more late-diverging than clades from old-growth forests, and whether tree phylogenetic beta diversity from old-growth to secondary forests is higher in burned than non-burned secondary forests.

Methods: We sampled tree communities in old-growth forests and in secondary forests with distinct disturbance histories (burned and unburned). We calculated mean family age in each plot, and tested for differences among forest types using ANOVA. A phylogenetic fuzzy-weighting procedure was employed to generate a matrix describing the abundance of tree clades per plot, which was then analysed using a principal coordinate analysis.

Results: Most clades found in old-growth forests were underrepresented in secondary forests, which have been heavily colonised by a single species from a young lineage that is not found in old-growth forests. Phylogenetic beta diversity was higher between unburned secondary forests and old-growth forests than between burned secondary forests and old-growth forests.

Conclusions: The capacity of Neotropical trees to colonise secondary forests and persist after fire disturbance may be related to the age of distinct lineages.