TITLE
The importance of disturbance: hurricanes modify the biotic and abiotic drivers of herbaceous understory plant dynamics in a tropical rain forest

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ABSTRACT
Natural and anthropogenic disturbances mediate the relative importance of biotic and abiotic drivers influencing herbaceous plant dynamics in tropical forest systems. Understanding these interrelated controls requires spatially and temporally explicit data that captures the changing microclimate and environmental landscape surrounding focal plants. In this study, we assessed the combined impacts of hurricanes, historical land use, and environmental covariates on *Heliconia caribbea* distribution in a subtropical montane forest in Puerto Rico.

Using long-term ecological data collected in the Luquillo Forest Dynamics Plot from 1990-2017, we explored the incidence, abundance, and size (shoot abundance) of *Heliconia caribbea* across censuses conducted within this period at approximately five-year intervals. We modeled the probability of sub-quadrat-scale *Heliconia caribbea* presence in each census and probability of survival from census to census as a function of tree abundance, basal area, light availability, elevation, soil type, slope, topography, and historical cover class, considering spatial autocorrelation at the quadrat-scale, using a mixed-effects modelling approach.

We observed greater tree abundance, as well as a wider spatial distribution, abundance, and shoot abundance of *Heliconia caribbea* in censuses following hurricanes that affected the forest plot in 1989 and 1998, followed by consistent declines in *Heliconia* presence and abundance in later censuses. The relative strengths of other biotic and abiotic predictor variables in the models changed significantly across censuses, mirroring the timing of hurricanes and demonstrating the critical role that such large-scale disturbance play in changing the controls on understory plant dynamics and the overall ecosystem equilibrium.