

Publication

Vegetation Dynamics at the Upper Reaches of a Tropical Montane Forest are Driven by Disturbance Over the Past 7300 Years

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We assessed tropical montane cloud forest (TMCF) sensitivity to natural disturbance by drought, fire, and dieback with a 7300-year-long paleorecord. We analyzed pollen assemblages, charcoal accumulation rates, and higher plant biomarker compounds (average chain length [ACL] of n-alkanes) in sediments from Wai'napanapa, a small lake near the upper forest limit and the mean trade wind inversion (TWI) in Hawai'i. The paleorecord of ACL suggests increased drought frequency and a lower TWI elevation from 2555–1323 cal yr B.P. and 606–334 cal yr B.P. Charcoal began to accumulate and a novel fire regime was initiated ca. 880 cal yr B.P., followed by a decreased fire return interval at ca. 550 cal yr B.P. Diebacks occurred at 2931, 2161, 1162, and 306 cal yr B.P., and two of these were independent of drought or fire. Pollen assemblages indicate that on average species composition changed only 2.8% per decade. These dynamics, though slight, were significantly associated with disturbance. The direction of species composition change varied with disturbance type. Drought was associated with significantly more vines and lianas; fire was associated with an increase in the tree fern *Sadleria* and indicators of open, disturbed landscapes at the expense of epiphytic ferns; whereas stand-scale dieback was associated with an increase in the tree fern *Cibotium*. Though this cloud forest was dynamic in response to past disturbance, it has recovered, suggesting a resilient TMCF with no evidence of state change in vegetation type (e.g., grassland or shrubland).

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