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Prediction of Individual Tree Mortality in Tropical Forests Using Inexpensive Field Methods

Gabriel Arellano[1], Mohizah Mohamad[2], Sylvester Tan[2], Nagore García-Medina[3], and Stuart J. Davies[1]

[1] CTFS-ForestGEO, Smithsonian Tropical Research Institute
[2] Sarawak Forest Department, Malaysia
[3] Universidad Autónoma de Madrid, Spain

Contact: Gabriel Arellano [gabriel.arellano.torres@gmail.com]

Individual mortality is a fundamental component of the life-history of tree species. Variation in mortality rates drives forest structure and dynamics, floristic composition, and carbon and nutrient cycles. A much better understanding of what determines the spatial and temporal variation in mortality rates is required to more accurately predict the future of the global carbon sink. As part of the Next Generation Ecosystem Experiment (NGEE) Tropics, we developed a protocol to monitor annual tree and biomass mortality, including an assessment of factors associated with the death of trees that may help in predicting future tree mortality. The protocol includes assessment of mode of death, nature of tree damage (broken, uprooted, standing), estimation of remaining biomass (proportion of remaining trunk and crown), and assessment on other aspects potentially related to the probability of survival (crown illumination, degree of leaning, liana infestation, presence of fungi, wounds, trunk deformities, leaf damage, etc.). The protocol is both space- and size-stratified to ensure detection of habitat and size-related variation in mortality patterns. The protocol is currently being implemented in 10 large-scale plots (16-52 ha) in
CTFS-ForestGEO network.

To investigate potential patterns of mortality in one site, we analyzed the impact of crown damage, crown illumination, wood density and prior growth on survival in the Lambir CTFS-ForestGEO plot (Malaysia), using four censuses of ~28,000 trees ≥10 cm dbh between 1992 and 2008. We are using structural equation modeling to disentangle causal relationships affecting survival and correlations due to life history trade-offs.