

Annual tree growth, mortality, physical condition, and microsite in an old-growth tropical rain forest, 1983–2010

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Abstract. Tree species richness in a tropical rain forest typically exceeds several hundred species over mesoscale landscapes. There is no generally accepted ecological theory that accounts for the coexistence of so many species with the same general morphologies and the same basic requirements of light, nutrients, water, and physical space. In part this lack of theory rests on the lack of understanding of the post-establishment ecology for the vast majority of tropical tree species. Of even more immediate concern is the lack of data on tree performance in relation to climate; such data are critical to project effects of global climate change on tropical forests.

Here we present data on the post-establishment ecology of 10 species of tropical wet forest trees selected to span a range of predicted life history patterns. The study site was terra firme old-growth tropical wet forest at the La Selva Biological Station in Costa Rica. Particular emphasis has been placed on evaluating the precision of measurements, metadata development, and annual measurements of all individuals; the annual time step is a temporal interval that captures the scale of climate and microhabitat variations and the responses of trees to this variation in tropical rain forest.

We present data on survivorship, growth, and microhabitat for 4027 individuals from established seedling to canopy-level individuals measured annually between 1983 and 2010 (the study is ongoing and complete through 2011), thus adding 10 years' data and >600 new individuals to the data set we published in *Ecological Archives* in 2006. The data set is unique in its scope (number of years of continuous annual measurements, number of monitored individuals) as well as in the degree of metadata documentation and unrestricted access to the raw data (data sets published in 2000, 2006, and this paper). The data have been used to study life history patterns, relations with microhabitats including edaphic factors and crown light environments, relations among ecophysiology, morphology, and performance, the relation of tree performance to climate variation both at local and global scales, and in a variety of remote-sensing studies.

Key words: *Costa Rica; emergents; global change; La Selva; life history strategies; physical damage; tree demography; tropical rain forest; tropical trees.*

The complete data sets corresponding to abstracts published in the Data Papers section of the journal are published electronically in *Ecological Archives* at <http://esapubs.org/archive>. (The accession number for each Data Paper is given directly beneath the title.)

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