Title: Identifying plant resource acquisition and allocation strategies for nutrient-enabled ELM-FATES

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Project Abstract: The ability of global models to correctly partition carbon inputs between biomass pools is critical for determining carbon residence time and capturing global carbon cycle dynamics. The allocation of biomass to leaf, stem, and root is intimately linked to the acquisition of key resources needed to support plant function. Within a community, there exist numerous strategies for acquiring and allocating resources, operating within developmental and competitive spaces, that ultimately shape the structure and function of ecosystems over long time scales. Of particular interest are the resource acquisition and allocation strategies of tropical forests—with soil nutrient concentrations (nitrogen and phosphorous) hypothesized to influence primary production and regulate forest growth. Size-structured or cohort-based models provide the means to test hypothesized allocation and acquisition strategies and quantify the impacts of the costs and benefits of these strategies on co-existence under resource limitation. We examined the current implementation of nutrient acquisition and carbon allocation schemes across a range of size-structured models (e.g., ELM-FATES, ED2, LPJ-GUESS) to assess the current state of the science and connect these efforts with current knowledge of plant functional strategies for resource acquisition and allocation. Framing acquisition and allocation along axes of costs and benefits, we identify multiple strategies to aid in the simulation of trait diversity and coexistence found in tropical forests along resource gradients. The results of this work will be used to propose future model developments and hypotheses which may be tested within the context of the larger NGEE-Tropics project.